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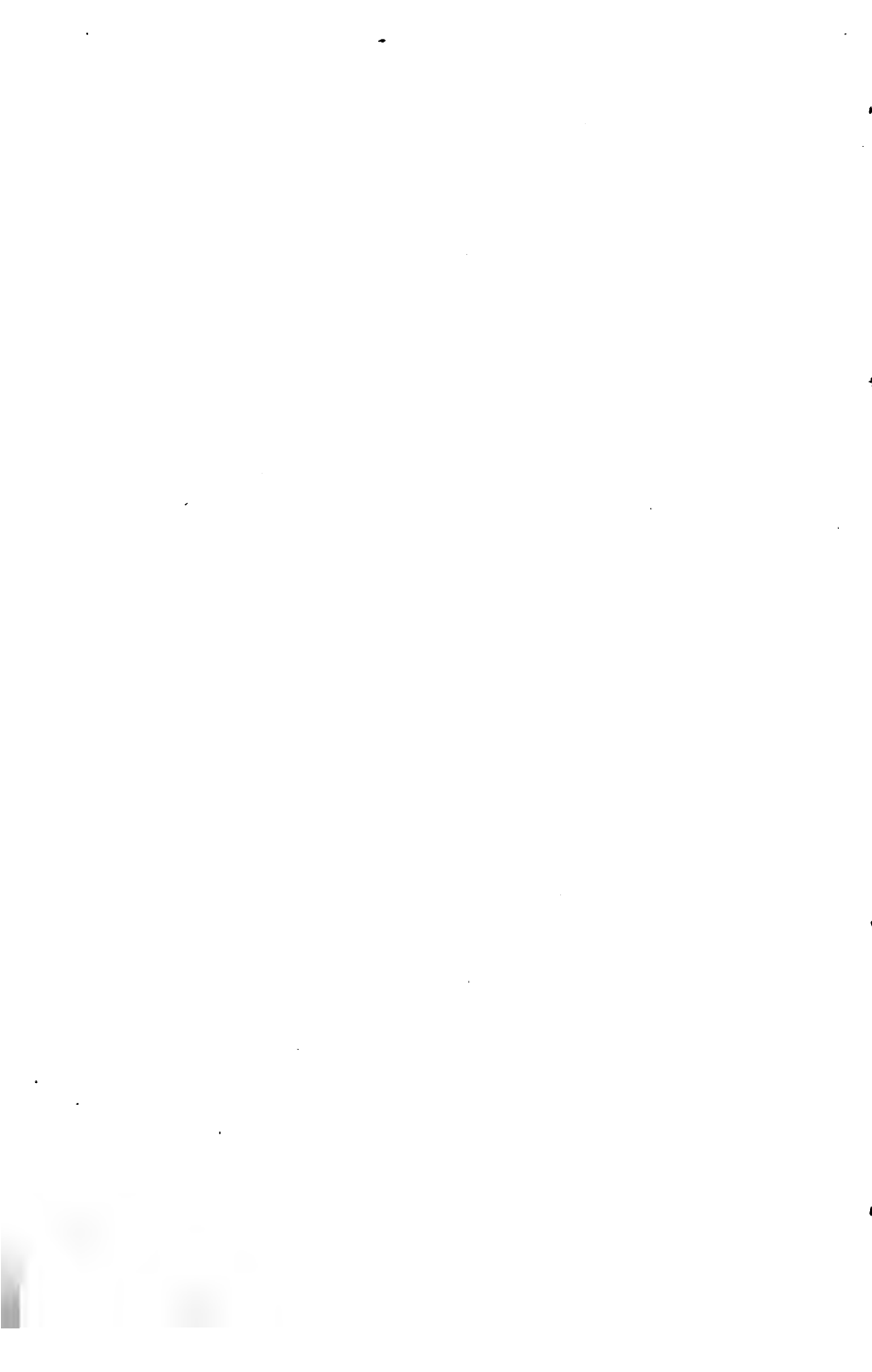


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The Harvest of the Sea.



THE
HARVEST OF THE SEA.

BY
JAMES G. BERTRAM.

POLONIUS—Do you know me, my lord?

HAMLET—Excellent well ; you are a fishmonger.

Shakespeare.



FOURTH EDITION.

ALEXANDER GARDNER,
LONDON : 12 PATERNOSTER ROW ; AND PAISLEY.

1885.

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1885

PREFATORY NOTE.

As I pen this prefatory note I have in my mind the saying of Sir Walter Scott that "when a book passes a second edition it has got beyond the reach of criticism." But in all probability it is by the aid of the critics, that the passing of the Rubicon has been accomplished, and the success implied by a third and fourth edition, achieved. This book at all events was well received on its first appearance by the Press, several excellent and most critical verdicts having been given, for which I was at the time thankful. That the present edition will be found still more worthy of notice than its predecessors, I feel confident—the book in my humble opinion being now much nearer perfection than when it first saw the light—successful as it then happily proved.

The "HARVEST OF THE SEA" has been a great success—not because it has sold so well that a fourth edition is now called for, or that critics and reviewers praised it, but because it has led to a continuous discussion of fishery economy ever since the volume was issued, and has, therefore, in the best sense, fulfilled its "mission." Fishery subjects are now discussed with calmness as well as increased knowledge; and those who, along with myself, ventured about twenty years ago to direct attention to what was wrong, will never again be tabooed or written down as visionaries or enthusiasts. Common sense has triumphed, and much in our fishery economy that was wrong has been put right, or is now in process of being rectified.

GLASGOW, August, 1885.

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The Harvest of the Sea.

INTRODUCTORY NOTE: OUR FISH WEALTH.

Various Estimates of our Fish Wealth—Mr. Leoni Levi, Mr. Spencer Walpole, and the Duke of Edinburgh's figures—The Author's guess—The London fish supply—Mr. J. R. M'Culloch's estimate of the value of British Fisheries.

VARIOUS estimates have lately been formed of the food wealth which we obtain from the seas and rivers which wash our coasts, as also from the distant fishing grounds of that great fish pond—the German Ocean. The value of the fish caught by the fishermen of the United Kingdom has been set down at sums varying from five to eleven millions of pounds, the latter sum being given by Mr. Leoni Levi in his lecture on “The economic condition of fishermen.” In all probability Mr. Levi's figures are derived from statistics furnished by the Hon. Thos. Spencer Walpole, now Governor of the Isle of Man, but formerly one of Her Majesty's Inspectors of Salmon Fisheries, who, founding on the 30,000 tons of fish captured by the fishermen of Great Grimsby, says if “the 110,000 fishermen of the United Kingdom were each to take as much fish as the Grimsby men, it follows that 1,000,000 tons of fish must be annually taken by British fishermen out of British waters. If only half the amount is taken, 500,000 tons of fish must be annually taken. If this vast amount of fish is only worth £10 a ton, or a little over twopence a pound, the British seas must yield £11,000,000 a year to British fishermen.” In an estimate made by the Duke of Edinburgh, his Royal Highness says,—“the labours of our fishermen succeed in providing for the population of these islands a supply of fish food amounting to about 615,000 tons weight per annum, which, at £12 per ton, represents a money value of £7,380,000.” These figures may be taken to denote the wholesale value of the fish which are captured—the fishermen who undergo the la-

bour of taking them by net and line are not well paid, when the high prices obtained by retailers are taken into account. But it must not be forgotten that all estimates of the kind referred to are but guesses of the extent of our fish wealth. I have myself attempted "a guess" founded on long continued and careful inquiry, and have arrived at figures which greatly exceed those even of Professor Levi or Mr. Walpole, namely, a total sum of £14,000,000, which is made up as follows:—Round and flat fish of all kinds, £6,000,000; herring, pilchard, sprat and white-bait, £3,500,000; oysters, lobsters, and other shell fish, £3,000,000; salmon, mackerel, and fancy fishes, £1,500,000.

As the information on which these figures is founded will be given in succeeding pages of this work, I need not at present enter into details of the varied calculations which I had to make. Our fishermen having easy and free access to an enormous expanse of water, both off our immediate coasts, and in the 130,000 square miles of the stormy North Sea, the yearly take of fish of all kinds should be commensurate to the space fished. And so it is. We have but to figure the population of London and the other populous cities and towns of the three kingdoms, and consider that if each person inhabiting them were to consume only three shillings worth of white fish per annum, that small amount of consumption for a population of 35,000,000 persons would represent over five millions sterling. Although this may seem a rough and ready way of calculating our consumption of white fish—that is cod, haddock, soles, turbot, whiting, and flounders, it will bear "looking into;" for which process the reader is provided with facilities in this book. London alone used to consume or otherwise dispose of every year 130,000 tons of fish, and during a recent visit to the great piscatorial bourse I ascertained that the weight mentioned, despite rival markets, was being kept up at Billingsgate. The total value of the British fisheries, it may be here mentioned, was set down many years ago by Mr. J. R. McCulloch, author of the "Commercial Dictionary," as £5,000,000 sterling.

We possess no official figures, however, by which to demonstrate the value of the harvest of the sea. Never at any time, indeed, have we possessed more than a few rudimentary calculations illustrative of the "bounty of the waters," and therefore, interesting as the subject is, it is not possible to do more than guess the sum of our piscatorial riches. We can guess to-day, however, with a greater degree of accuracy than could be done

fifty years since. Some official cognizance, it is proper to mention, has for a long period been taken in Scotland of two branches of our fisheries; namely, the catch of herrings and the capture of several members of the cod fish family, but only such fish are taken note of as are "cured." As a clever anatomist can, from a single bone, build a perfect anatomical structure, even that of an extinct animal, which he can never have seen in the flesh, I may be permitted to hope, with the aid of the many facts and figures I have industriously collected in the pages to follow, to be able to present to the reader a tolerably precise notion of the incidence and value of a productive and lucrative industry.

LIFE AND GROWTH OF FISH.

Classification of Fish—Their Form and Colour—Their Modes and Means of Life—Curiously-shaped Fish—Senses of Smell and Hearing in Fish—The Food of Fishes—Fish nearly insensible to pain—Fecundity of Fish—Percentage of their Abundance—Sexual Instinct of Fish—External Impregnation of the Ova—Ripening of a Salmon Egg—Birth of a Herring—The Rich *versus* the Poor Man's Fish—Floating Spawn—Curious Stories about the Growth of the Eel—All that is known about the Mackerel—Whitebait—Fish as a rule not Migratory—Growth of Fish Shoals—The Balancing Power of Nature.

FISH form the fourth class of vertebrate animals, and, as a general rule, live in water; although in Ceylon and India species are found which live in the earth, or, at any rate, that exist in mud, not to speak of others said to occupy the trees of those countries! The classification of fishes given by Cuvier is usually adopted. He has divided these animals into those with true bones, and those having a cartilaginous structure; the former, again, being divided into acanthopterous and malcopterous fish. Other naturalists have adopted more elaborate classifications; but Cuvier's being the simplest has a strong claim to be considered the best, and is the one generally used.

A fish breathes by means of its gills, and progresses only by means of its tail. This animal is admirably adapted for progressing through the water, as may be seen from its form, and fish are exceedingly beautiful, both as regards shape and colour. There are comparatively few persons, however, who have an opportunity of seeing them at the moment of their greatest brilliancy, which is just when they are brought out of the water. I allude more particularly to some of our sea fish—as the herring, mackerel, etc. The power of a fish to take on the colour of its hiding-place may be mentioned; various kinds, when in the water, as may be observed at the Brighton and Crystal Palace Aquariums, are not to be distinguished from the vegetable matter in which they take shelter. It is almost impossible to paint a fish so as accurately to transmit to canvas its exquisite shape and glowing colours, because the moment it is taken from its own element its form alters and its delicate hues fade: and in different localities fish have, like the chameleon, different

hues, so that the artist must have a quick eye and a responding hand to catch the fleeting tints of the animal. Nothing, for instance, can reveal more beautiful masses of colour than the hauling in of a drift of herring-nets. As breadth after breadth emerges from the water the magnificent ensemble of the fish flashes ever-changing upon the eye—a wondrous gleaming mixture of blue and gold, silver and purple, blended into one great burning glow, brilliantly lighted by the soft rays of the newly-risen sun. But, alas for the painter! unless he can instantaneously fix the burnished mass on his canvas, the light of its colour will fade, and its harmonious beauty become dim, long before the boat can reach the harbour. The brightly-coloured fish of the tropics are gorgeous, as the plumage of tropical birds; but as regards their flavour and food power, they cannot for a moment be compared with that beautiful fish—the common herring, of our British waters.

If the breathing apparatus of a fish were to become dry the animal would at once suffocate. When in the water a fish has very little weight to support, as its specific gravity is about the same as that of the element in which it lives, and the bodies of these animals are so flexible as to aid them in their movements, while the various fins assist either in balancing the body or in aiding progress. The motion of a fish is excessively rapid; it can dash through the water with lightning-like velocity. Many of our sea fish are curiously shaped, such as the hammer-headed shark, the globe-fish, the monk-fish, the angel-fish, etc.; then we have the curious forms of the rays, the flounders, and of some “fancy fish;” but all kinds are admirably adapted to their mode of life and the place where they live—as, for instance, in a cave where light has never penetrated fish have been found without eyes!

Fresh-water fish do not vary much in shape, most of them being very elegant. Fish are cold-blooded, and nearly insensible to pain, their blood being only two degrees warmer than the element in which they live. It is worthy of note that fish have small brains compared to the size of their bodies—considerably smaller in proportion than in the case of birds or mammalia, but the nerves communicating with the brain are as large in fish, proportionately, as in birds or mammalia. The senses of sight and hearing are thought to be well developed in fish, likewise those of smell and taste, particularly smell, which chiefly guides them in their search for food. Fish, I think, have a very keen

scent; thus it is that strong-smelling baits are successful in fishing. The French people, for instance, when seeking for sprats and sardines, bait the ground with prepared cod-roë, which adds largely to the expense of that branch of fishing in the Bay of Biscay. As an evidence of fish having a strong sense of smell, salmon-roë used to be a deadly trout-bait. Some naturalists assert that fish do not hear well, which is contrary to my experience; for after repeated trials of their sense of hearing, I found them as quick in that faculty as in seeing; and have we not all read of pet fish summoned to dinner by means of a bell, and of trouts and cod-fish that have been whistled to their food like dogs? Water is an excellent conductor of sound; it conveys noise of any kind to a great distance, and nearly as quick as air. Benjamin Franklin often experimented on water as a conductor, and arrived at the conclusion that its powers in this way are wonderful. Most kinds of fish are voracious feeders, preying upon each other without ceremony; and the greatest difficulties of anglers are experienced after fish have had a good feed, when a practised artist, with seductive bait, cannot induce them even to nibble. Many fish have a digestion so rapid as to be comparable only to the action of fire, and on good feeding-grounds the growth of fish corresponds to their power of eating. In the sea there exists an admirable field for observing the cannibal propensities of fish, where shoals of one species have apparently no other object in life than to chase other kinds with a view to eat them.

Much has been said and written about the food of fishes, and eager inquirers have been industrious examiners of thousands of stomach-bags, sometimes with precious little result. Fish of all kinds are to be found wherever their food is most plentiful, and in the case of the herring, it will doubtless some day be found, that the eccentric movements of the shoals are in most cases due to the plentifulness or exhaustion of the food upon which they subsist. When stomachs of these abounding fish have been at different times examined, they were found to contain a large amount of many kinds of food according to the locality or the period of the year. The sand lance at certain seasons seems to be a favourite food of the herring, and if an example I once examined may be held as proof, they devour enormous numbers of these animals. The stomach of the particular fish I am alluding to contained traces of its having eaten twenty-two sand launces, while one of the latter had undoubtedly gorged itself with minute crustaceans!

That herrings eat their own spawn (*i.e.*, eggs), and devour fish of their own kind is certain enough; and I rather think that all fish do the same. The enormous fecundity of many kinds of fish is referred to in a following page; and it is certain, I believe, that many of the millions of ova voided by one family of fish are devoured by the members of other fish families. Have not anglers twenty times over found the yellow trout gorged with the ova of the salmon? And it is not known that the Pike looks upon the tiny Parr with especial fondness, and esteems it a tid-bit well worth watching and waiting for? The ocean is everywhere populous with hungry cannibals. The herring, it is well known, is followed throughout its career by hordes of enemies: the cod fish is reputed at certain seasons to live and grow fat upon herrings! "The principal food of adult cod," says Professor Huxley, "appears to be herring. If we allow only one herring to each codfish per diem, the cod in a square mile of shoal will consume 840,000,000 herring in a week." Some clever fishermen know when and where to find the fish they are in search of, from observing that their food is plentiful in a given place. In these matters America has of late been affording us a great amount of knowledge of the most practical kind. This subject, however, is rather more technical than is suited to the tastes of "the general reader," and so I content myself by offering the foregoing brief remarks on this interesting branch of the natural history of our food fishes.

To compensate for the waste of life incidental to their place of birth and their ratio of growth, nature has endowed this class of animals with enormous reproductive power. Fish yield their eggs by thousands or millions, according to the danger incurred in the progress of their growth. There is nothing in the animal world that can in this respect be compared to them, except perhaps a queen bee, with fifty thousand young each season; or the white ant, which produces eggs at the rate of fifty per minute, and goes on laying for a period of unknown duration; not to speak of that terrible domestic *bugbear* which no one likes to name, but which is popularly supposed to become a grandfather in twenty-four hours! The little aphides of the garden may also be noted for their vast fecundity, likewise the common house-fly. During a year one green aphid may produce one hundred thousand millions of young; and the house-fly lays twenty millions of eggs in a season! But although there may be thirty thousand eggs in a herring, the reader must bear in

mind that if these be not vivified by the milt of the male fish, they rot in the sea, and never become of food value, except perhaps to some minor monster of the deep. Millions of the eggs emitted by the cod and the herring never come to life—many of them from lack of fructifying power, others being devoured by enemies. Then, again, of those eggs that are ripened, it is ascertained from careful inquiry, that fully ninety per cent of the young fish perish before they are six months old. Were only half the eggs to come to life, and but one moiety of the young fish to live, the sea would so abound with animal life that it would be impossible for a boat to move in its waters. But we can never hope to realise such a sight; and when it is considered that a single shoal of herrings consists of many millions of individual fish, and takes up a space in the sea far more than that occupied by the cities of London, Dublin, Edinburgh, and Glasgow united, and yet gives no impediment to navigation, my readers will be able to understand the magnitude of our fish supplies; but, by the destruction of fish life from natural causes, the breeding stock is kept down to an amount that may not be far from the point of extermination.

The figures of fish fecundity are quite reliable, and not dependent on guessing, because different persons have taken the trouble, the writer among others, to count the eggs in the roes of some of our fish, that they might ascertain exactly their amount of breeding power. It is well known that the female salmon yields eggs at the rate of about eight hundred for each pound weight, and some fresh-water fish are even more prolific; sea fish, again, far excelling these in reproductive power. The sturgeon, for instance, is wonderfully fecund, as much as two hundred pounds weight of roe having been taken from one fish, yielding a total of 7,000,000 of eggs. I possess the results of several investigations into fish fecundity, which were conducted with attention to details, and without any desire to exaggerate: these give the following results:—Turbot, 11,000,000; Cod fish, 3,400,000 and 4,780,000; flounder, 1,250,000; sole, 1,000,000; mackerel, 500,000; herring, 22,000 and 35,000, and smelt, 36,000.

Any person who wishes to manipulate these figures may try by way of experiment a few calculations with herring. The produce of a single herring is, say, thirty-six thousand eggs, but we may—the deduction being a most reasonable one—allow that half of these never come to life, which reduces the quantity to

eighteen thousand ; and we may safely calculate that the breeding stock by various accidents will be reduced to nine thousand individuals before it becomes reproductive ; and granting half of these to be females, or let us say, for the sake of rounding the figures, that four thousand of them yield roe, we shall find by multiplying that quantity by thirty-six thousand (the number of eggs in a female herring) that we obtain one hundred and forty-four millions as the produce say in two years of a single pair of herrings ; and although half of these might be taken for food as soon as they were large enough, there would still be left an immense breeding stock even after all casualties had been given effect to ; so that the devastations committed on the shoals while capturing for food uses must be enormous, if, as is asserted, they affect the reproductiveness of these useful animals. Buffon has said that if a pair of herrings were left to breed and multiply undisturbed for a period of twenty years, the result would be a bulk of fish equal to that of the globe on which we live ! Of course this is but guesswork. Practical people do not think that, taking all times and seasons into account, five per cent. of the roe of our herrings come to life.

Some interesting particulars as to where the spawn of certain fishes remain from the time of its extrusion from the body of the parent fish till it comes to maturity, have of late years been obtained and published by Professor Sars and other inquirers and observers. It used to be pretty generally taken for granted that the eggs of all fish were exuded on sea bottom, or if not, that they gravitated to that position as a matter of course. In the case of the salmon and trout that is so, but the spawn of the cod fish, and presumably the eggs of other members of the gadidæ family, are known to float *on* (or *in*) the top waters of the sea. It has been also proved in the case of some of the flat fish that their ova floats till the young animal is perfected and escapes from its fragile prison. We know not what other discoveries of a like kind await us, but in view of the great fuss which of late years has been made about the trawl as an instrument of destruction on the spawning beds, the facts just alluded to are of much importance.

It is known even to *tyros* in the study of natural history, as well as anglers and others interested, that the impregnation of fish-eggs is a purely external act ; but at one time this was not believed, and a phase of the experiments at the Stormontfield salmon-breeding ponds was dedicated to a solution of this

question, with what result may be guessed. The old theory, that it is contrary both to fact and reason that fish can differ from land animals in the matter of the fructification of their eggs, was signally defeated, and the question conclusively settled at the ponds in a very simple way—namely, by placing in the breeding-boxes a quantity of salmon eggs, which not having been brought into contact with milt, rotted away. Curious ideas used to prevail on this branch of natural history. Herodotus observes of the fish of the Nile, that at the spawning season they move in vast multitudes towards the sea; the males lead the way, and emit the engendering principle in their passage; this the females absorb as they follow, and in consequence conceive, and when their ova are deposited, they are then matured into fry! Linnæus backed up this idea, and asserted that there could be no impregnation of the eggs of any animal out of the body. It is this wonderfully exceptional principle developed in fish life that gave rise to pisciculture—*i.e.*, the artificial impregnation of the eggs of fish forcibly exuded and brought into contact with the milt, independent altogether of the will or instinct of the animal.

The principle which brings male and female together at the spawning period is unknown. It is supposed by some naturalists that fish do not gather in shoals till they assemble to perform the grandest action of their nature, and that till such period each animal lives a separate life. If we set down the sense of smell as the power which attracts the fish to each other, we shall be nearly correct; cold-blooded animals cannot have any more powerful instinct. A very clever Spanish writer on pisciculture hints that the fish have no amatory feeling for each other at that period, thus forming a curious exception to most other animals, and that it is the smell of the roe in the female which attracts the male.

This idea—*viz.*, as to the shoaling of fish² at the period of spawning only—has been thrown out in regard to the herring by parties who do not admit even a partial migration from deep to shallow water, which, however, is an idea stoutly held by some writers on the herring. It is rather interesting, however, in connection with this phase of fish life, to note that particular shoals of herrings deposit their spawn at particular places, that the eggs come simultaneously to life, and that it is certain that the young fish remain together for a considerable period—a few months at least—after being hatched. This is

well known from large bodies of young herring being caught during the sprat season: these could not, of course, have assembled to spawn, being too young, and without milt or roe. This, if these fish separate, gives rise to the question—At what period do the herrings begin their individual wanderings? Sprats, of course, may have come together, at the period when they are so largely captured, for the purpose of perpetuating their kind; but, if so, they must live long together before they acquire milt or roe. And how is it that we so often find young herrings in sprat shoals, or *vice versa*? Then, again, how comes it that fishermen do not frequently fall in with the separate herrings during the white-fishings season? How is it that fishermen find particular kinds of fish always on particular ground? How is it that eels migrate in immense bodies? My opinion is, that particular kinds of fish do hold always together, or, at all events, gather at particular seasons into greater or lesser bodies. Life among the inhabitants of the sea is, doubtless, quite as diversified as life on land, where we observe that many kinds of animals colonise—ants, bees, etc. Are, therefore, the old stories about each kind of fish having a king so absolutely incredible after all? That there are schools of fish is certain; how the great bodies may be divided or governed, none can tell.

It is noteworthy that fish-eggs afford us an admirable opportunity of studying a peculiarly interesting stage of animal life—namely, the embryo stage—which, naturally enough, is obscure in all animals. Having observed the eggs of salmon in all stages of progress, from the period of their first contact with the milt till the bursting of the egg and the coming forth of the tiny fish, I venture briefly to describe what I have seen, because salmon eggs are of a convenient size for continued examination. The roe of this fine fish is, I daresay, pretty familiar to most of my readers. The microscope reveals the eggs of salmon as being more oval than round, although they appear quite round to the naked eye. A yolk seems to float in the dim mass, and the skin or shell appears full of minute holes, while there is an appearance of a kind of funnel opening from the outside and apparently closed at the inner end. The milt is found to swarm with a species of very small creatures with big heads and long tails, apparently of very low organisation. On the contact of this fluid with the egg, into which it enters by the canal, an immediate change takes place—the ovum becomes illuminated by some curious power, and the egg appears a great deal brighter and

clearer than before. It is surely remarkable that, by the mere touching of the egg with this wonder-working sperm, so great a change should take place—a change indicating that the grand process of reproduction characteristic of all living nature has begun, and will go on with increasing strength to maturity.

Salmon-spawn is so accessible, comparatively speaking, as to render it easy to trace the development from the egg of the complete animal. As may be supposed, however, the transmutation of a salmon egg into a fish is a tedious process, taking above a hundred days. The eggs of the female, under the natural system of spawning, are laid in the secluded and shallow tributary of some choice stream, in a trough of gravel ploughed up by the fish with great labour, and are there left to be wooed into life by the constant murmuring of the water. From November till March, through the storms and floods of winter, the ova lie hid among the gravel, slowly but surely quickening into life; and few persons would guess, from a merely casual glance at the tributary of a great salmon stream, that it held among its bubbling waters such countless treasures of future fish. Practised persons will find a burrow of salmon eggs with great precision; and a little stretch of water may contain perhaps 100,000 eggs waiting to be summoned into life.

We have never yet been able to obtain a sight of the ripening eggs of any of our sea fish at a time when they would prove useful to us. No one, as far as I know, has seen the young herring burst from its shell under such advantageous circumstances as we can view the salmon ova; but I have seen bottled-up spawn of that fish just after it had ripened into life, the infant animal being remarkably like a fragment of cotton thread that had fallen into the water: it moved about with great agility, but required the aid of a microscope to make out that it was a thing endowed with life. Who could suppose, while examining those wavy floating threads, that in a few months afterwards they would be grown into beautiful fish, with a mechanism of bones to bind their flesh together, scales to protect their body, and fins to balance and guide them in the water? But young herring cannot be long bottled up for observation, or be kept in an artificial atmosphere; for in that condition they die almost before there is time to see them live; and when in the sea there are no means of tracing them, because they are speedily lost in an immensity of water. Perhaps with the aid of our aquariums we shall be able to trace the progress of the fish with more exactitude.

There are points of contrast between the salmon and the herring which are worthy of notice. They form the St. Giles' and St. James' of the fish world, the one being a portion of the rich man's food, the other filling the poor man's dish. The salmon is hedged round by protecting Acts of Parliament, but the herring gets leave to grow just as it swims, parliamentary statutes not being thought necessary for its protection. The salmon is born in a fine nursery, and wakened into life by the music of beautiful streams: nurses and night-watchers, hover over its cradle and guide its infant ways; the herring, however, like the brat of some wandering pauper, is dropped in the great ocean workhouse, and cradled amid the hoarse roar of ravening waters, whether it lives or dies being a matter of no moment, and no person's business. Herring mortality in its infantile stages is appalling, and even in its old age, at a time when the rich man's fish is protected from the greed of its enemies, the herring is doomed to suffer still. And then, to finish up with the same appropriateness as they have lived, the venison of the waters is daintily laid out on a slab of marble, while the vulgar but beautiful herring is handled by a dirty costermonger, who drags it about in a filthy cart drawn by a wretched donkey. At the hour of reproduction the salmon is guarded with jealous care from the hand of man, but at the same season the herring is offered up a wholesale sacrifice to the destroyer. It is only at its period of spawning that the herring is fished. How comes it to pass that what is a high crime and misdemeanour in the one instance is a government-rewarded merit in the other? To kill a gravid salmon is as nearly as possible felony; but to kill a herring as it rests on the spawning-bed is an act at once meritorious and profitable!

All fish are not oviparous. There is a well-known blenny which is viviparous, the young of which at the time of their birth are so perfect as to be able to swim about with great ease; and this fish is also very productive. Our skate fishes are all viviparous. "The young are enclosed in a horny capsule of an oblong square shape, with a filament at each corner. It is nourished by means of an umbilical bag till the due period of exclusion arrives, when it enters upon an independent existence." I could name a few other fish which are viviparous. In the fish-room of the British Museum may be seen one of these. It is known as *Ditrema argentea*, and is plentifully found in South America. But information on this portion of the natural his-

not more than 70,000,000 or 80,000,000 are annually taken by the Norwegian fishermen. The herring, too, appears to be exceedingly numerous from the fact of our only being able to obtain access to it when it assembles in shoals in order to spawn; but the cod fish, to use a homely simile, is "a dripping roast," and tens of thousands are being taken day by day by our industrious fishermen. I am inclined to think, from careful observation and industrious personal inquiry, that the haddock is the fish which we obtain in the greatest quantity. Enormous numbers of this excellent table-fish are annually captured to be sold fresh, whilst countless thousands are sold as cured; that is, "smoked" as Finncans and Eyemouths. The sole is also a most abundant fish, being on sale, in countless thousands, all the year round; but as the question of the supply of all these fishes is elsewhere alluded to, I need not further discuss their percentages of abundance in this place.

The eel may be taken as an example of our ignorance of fish life. Do professed naturalists know anything about it beyond its migratory habits?—habits which, from sheer ignorance, have at one period or another been assumed as pertaining to all kinds of fish. The tendency to the romantic, specially exhibited in the amount of travelling power bestowed by the elder naturalists on this class of animals, would seem to be very difficult to put down. An old story about the eel was gravely revived a few years ago, having the larger portion of a little book devoted to its elucidation—a story seriously informing us that the silver eel is the product of a black beetle! But no one need wonder at a new story about the eel, far less at the revival of this old one; for the eel is a fish that has at all times experienced the greatest difficulty in obtaining recognition as being anything at all in the animal world, or as having respectable parentage of even the humblest kind. In fact, the study of the natural history of the eel has been hampered by old-world romances and quaint fancies about its birth, or, in its case, may I not say invention? "The eel is born of the mud," said one old author. "It grows out of hairs," said another. "It is the creation of the dews of evening," exclaimed a third. "Nonsense," emphatically uttered a fourth controversialist, "it is produced by means of electricity." "You are all wrong," asserted a fifth, "the eel is generated from turf;" and a sixth theorist, determined to outdo all others, and come nearer the mark than any of his predecessors, assured the public that young eels are grown from particles scraped off old ones!

There can be no doubt that the eel is a curious animal even without the extra attributes bestowed upon it by this very original naturalist, for that fish is in many respects the opposite of the salmon : it is spawned in the sea, and almost immediately after coming to life proceeds to live in brackish or entirely fresh water. It is another of the curious features of fish life that about the period when eels are on their way to the sea, where they find a suitable spawning-ground, salmon are on their way from the sea to the river-heads to fulfil the grand instinct of their nature—namely, reproduction. The periodical migrations of the eel, on which has been founded the great fishing industry of Comacchio, on the Adriatic, can be observed in all parts of the globe : they take place, according to climate, at different periods from February to May ; the fish frequenting such canals or rivers as have communication with the sea. The myriads of young eels which ascend are almost beyond belief ; they are in numbers sufficient for the population of all the waters of the globe—that is, if there were reservoirs in which they might be preserved for food as required. The eel, indeed, is quite as prolific as the generality of sea fish. Eels have been noted to pass up a river from the sea at the extraordinary rate of eighteen hundred per minute ! This *montee* used to be called eel-fair. The very latest “news” about the natural history of the eel is conveyed to us in an elaborate paper by Dr. Jacoby, contained in the “Report of the United States Commission of Fish and Fisheries for 1879,” one of a series of volumes admirably edited by Mr. Spencer F. Baird, of the Smithsonian Institute. The article of the learned doctor is too long to be given in these pages. I have only room for a small morsel of it relating to a very curious fact in the biography of the eel, and which is embraced in the following question and answer, “What becomes of the fully grown eels after the spawning season ; why do they never return to the rivers, but disappear altogether ? The old eels, both male and female, die soon after the spawning season. The extraordinary rapid development of their organs of generation exhausts them to such a degree that they die soon after having spawned. This is the reason why they are never seen to return.”

It would be interesting, and profitable as well, to learn as much of any one of our sea-fish as we know of the salmon, and as considerable progress is now being made in observing the natural history of fish, we expect in time to know much more

than we do at present ; every thing in the fish world is not taken for granted as formerly, although we are still inclined rather to revive old traditions than to study or search out new facts. Naturalists are so ignorant of how the work of growth is carried on in the fish world—in fact, it is so difficult to investigate points of natural history in the depths of the sea—that we cannot wonder at less being known about marine animals than about any other class of living things. It is the want of precise information about the growth of fish that tells so heavily against our fisheries, for all is fish that comes to the fisherman's net, no matter what size the animals may be, or whether they have been allowed to perpetuate their kind. No person, either naturalist or fisherman, knows how long a period elapses from the date of its birth till a turbot or cod-fish becomes reproductive. It is now well known, in consequence of repeated experiments, that salmon grow with great rapidity, a consequence in some degree of quick digestive power. The cod-fish, again, reasoning from the analogy of its greatly slower power of digesting its food and from other corroborative circumstances, must be correspondingly slow in growth ; but people must not, in consequence of this slower power of digestion, believe all they hear about the miscellaneous articles often said to be found in stomachs of cod-fish, as a large number of the curiosities found in the intestinal regions of his codship are placed there by fishermen, as a joke, or to increase the weight, and so enhance the price of the animal.

As regards the natural history of one of our best-known food fishes, I have taken the pains to compile a brief *precis* of its life from the best account of it that is known. I allude to the mackerel ; and from a perusal of the following facts it will be seen that our knowledge of the growth of this fish is very defective. 1. Mackerel, geographically speaking, are distributed over a wide expanse of water, embracing the whole of the European coasts, as well as the coasts of North America, and this fish may be caught as far southward as the Canary Islands. 2. The mackerel is a wandering unsteady fish, supposed to be migratory, but individuals are always found in the British seas. 3. This fish appears off the British coasts in quantity early in the year ; that is, in January and February. 4. The male kind are supposed to be more numerous than the female. 5. The early appearance of this fish is not dependent on the weather. 6. The mackerel, like the herring, was at one time supposed to be a native of foreign seas. 7. This fish is laden with spawn in

May, and it has been known to deposit its eggs upon our shores in the following month. Now, we have no account here of how long it is ere the spawn of the mackerel quickens into life, or at what age that fish becomes reproductive, although in these two points is unquestionably obtained the key-note to the natural history of all fishes, whether they be salmon or sprats. In fact we have no precise information whatever as to power of growth. We have at best only a few guesses and general deductions, and we would like to know as regards all fish—*1st*, When they spawn; *2nd*, How long it is ere the spawn quickens into life; and *3rd*, At what period fish are able to repeat the story of their birth. These points once known—and they are most essential to the proper understanding of the economy of our fisheries—the chief remaining questions connected with fishing industry would be of comparatively easy solution, and admit of our regulating the power of capture to the natural conditions of supply.

As another example of long continued ignorance of fish life, I may instance that diminutive member of the herring family—the whitebait. This fish, which is so much better known gastronomically than it is scientifically, was thought at one time to be found only in the Thames, but it is much more generally distributed than is supposed. It is found for certain, and in great plenty, in three rivers—viz. the Thames, the Forth, and the Hamble. I have also seen it taken out of the Humber, not far from Hull, and have heard of its being caught near the mouth of the Deveron, on the Moray Firth; and likewise of its being found in plentiful quantities off the Isle of Wight, and in many parts of the Clyde. The whitebait has become celebrated from the mode in which it is cooked, and the excuse it affords to Londoners for an afternoon's excursion, as also from its forming a famous dish at the annual fish-dinner of her Majesty's ministers; but truth compels me to state that there is nothing in whitebait beyond its susceptibility of taking on flavour from the skilled cook.

The whitebait, however, if I cannot honestly praise it as a table fish, is particularly interesting as an object of natural history, there having been from time to time, as in the case of most other fish, some very learned disputes as to where it comes from, how it grows, and whether or not it be a distinct member of the herring family or the young of some other fish. The whitebait is a tiny animal, varying in length, when taken for

cooking purposes, from two to four inches, and has never been seen of greater length than five inches. In appearance it is pale and silvery, with a greenish back, and should be cooked immediately after being caught; indeed if, like Lord Lovat's salmon, whitebait could leap from the water into the frying-pan, it would be a decided advantage to those dining upon it, for if kept even for a few hours it becomes greatly deteriorated, and, in consequence, requires careful cooking to bring the flavour up to the proper pitch of gastronomic excellence.

Whitebait, we have over and over again been assured by various authorities, is the young of the shad; and a whole regiment of the young fish was once shown by Mr. Larkin, a Cheapside fishmonger, in order to prove the case. All sizes were marshalled in order, from the tiniest specimen to the comparatively monster parent of the progeny—the great shad itself. The verdict, however, was the Scotch one of “not proven.” It is not very well known who first promulgated the theory of whitebait being the young of the shad; but Donovan, the author of a *History of British Fishes*, is at least responsible for spreading the error. What must, however, surprise all who take the trouble to study the controversy is this fact, that if whitebait be young shad, their parents are very seldom seen. There is no shad-fishery in the Thames, or near the Thames, at present; yet millions of these so-called young shad are annually devoured by visitors to Greenwich, Blackwall, and Richmond, not to speak of the number eaten in the great metropolis. If the progeny, then, are plentiful, how come the parents to be scarce? is the idea immediately presenting itself to the mind when requested to believe whitebait to be young shad. Fishes of all kinds, and especially the herring kind, are very prolific; but even if the female shad yields its ova in thousands, the dangers the young ones encounter considerably diminish the number that come to life. Thousands of pairs of shads would therefore be required to produce the quantities of so-called whitebait which are annually brought to table during the summer season. Shad were at one time very abundant on the Thames; and this fact would no doubt be a good argument in the mouths of those who were of opinion that whitebait grew in time into that fish. If, however, we reject the shad as the parent of the whitebait, and conclude that fish to be a distinct species, we shall undoubtedly want to know a great deal more about it than that bare fact. First of all, we must know where the parent fish can be found;

secondly, if they be good for food ; and thirdly, at what season and in what markets they are sold : it seems so strange that we should be addicted to eating the fry of a fish we never see ! Besides, may we not reasonably enough conclude that if the fry be so very fine, the full-grown fish will be even more palatable ! It is curious that while there are thousands of whitebait in the Firth of Forth, and equally curious that they are caught chiefly on the sprat-ground there, no Edinburgh fishmonger, nor any of the Scottish fishermen, ever saw specimens of these fish with milt or roe in them. Nor did any of these persons ever see a whitebait bigger than the usual size, that is, ranging in length from one to about three inches. After they attain that size they become either sprats or herrings.

If what some naturalists have published in regard to its habits be true, the shad must be a very interesting fish. It has been hinted that it ascends from the sea to deposit its spawn in the rivers, being something like the salmon in that respect. In this phase of its life it is the opposite of the eel, which lives in fresh but spawns in salt water. What salmon do, shad can doubtless also accomplish, although it will go a long way to disprove what has been said by naturalists, if the shad should be proved not to be the parent of the whitebait, or rather, if it can be proved that whitebait are the young of some other fish. In the days when the herring was thought to be an animal of migratory habits, rushing continually from our own firths and bays to the icy polar seas, some of the giants of the tribe were poetically described as swimming in the van of the mighty *heer*, acting as the guides and leaders of the smaller fish. These giants were Thwaite shads ; but as it is now well known that the herring is local in its habits, and not migratory in the sense of taking long journeys, the shad must therefore be deposed from that leadership ; nor can it be even allowed the merit of being a tolerable table-fish, it is a coarse, insipid fish, and altogether destitute of the delightful flavour of the common herring.

What is whitebait if it be not the young of shad ? Is it, then, a distinct species ? It would be easy enough to befool the public with an absurd answer as to what whitebait is, because no writer, not the ubiquitous Buckland himself, can successfully contradict another on almost any point of fish growth. When we see the transformation of the tadpole into a frog, and the zœa into a crab, we need not be surprised at its having been once prophesied that the whitebait turned a bleak,

or the assertion that it undoubtedly grows into a herring (*clupea hargenus*); and if pressed for our reasons, we have a better answer to give than the young Scotch ploughman, who, being asked how he knew that God had made him, replied, after some little deliberation, that "it was the common clash of the country." In many places where whitebait are captured, fishermen believe them to be young herring—"herrinsile" they are called on the river Clyde; and this idea has been ventilated by the author in the popular periodicals of the day—it is an idea too that has long been common among our fishmongers. That whitebait are young herring, or sprats in an infantile stage, can be easily proved—on paper at least; and if our Government had a fish laboratory, such as the French have at Concarneau, the fact might very speedily be ocularly demonstrated. There has been a great amount of controversy as to the natural history of the herring during late years, and so many curious facts have been educed that no one need be surprised to learn that whitebait are truly the young of that fish. This may seem extraordinary; but without being dogmatic, it may be permitted us to say that the points of resemblance between herring and whitebait are wonderfully numerous and convincing, as well in the outward appearance as to the anatomical structure of the two fishes. At all events the young of the shad and the true whitebait (at *some* places, such is the demand, that all sorts of fry are "manufactured" into the latter fish, there being so many who do not know one from the other) are very different in many essential points as in the formula of the fin-rays and the number of the vertebræ. Of course a young animal will change greatly in appearance during growth. The whitebait, for instance, in common with the sprat, has a serrated belly; but if it be the young of the herring, it must grow out of that serration. Any man who may know even a little about fish, will have seen that the so-called dish of whitebait, served at a fashionable tavern, is a varied mass of minnows, young bleak, infantile sprats, and the fry of other well-known fish. So much for this tavern celebrity!

Assuming "whitebait" to be young herring, we are entitled to ask at what date the fish of that name, sold in London in June and July, were spawned. The herrings at Wick, for example, are taken full of spawn up till the end of the great fishery in August; at what time, then, if whitebait be young herring, would those we can now eat at Blackwall be spawned? This, of course, involves a surmise as to the rate of growth of the

herring itself, upon which question there has from first to last been much speculation, many very dissimilar ideas having been propounded as to the period at which the "poor man's fish" arrives at the reproductive stage. As we know that there are different races of herring coming to maturity at different times, there ought to be no difficulty on this point, as the waters must constantly contain fish of all ages, and it appears certain that the whitebait of May and June cannot be older than the year; it seems pretty certain, also, that the sprat-sized herrings which begin to come to market early in November are a little over a year old; they were probably released from their tiny shells early in the August or late in the July of the previous year. It is admitted by at least one competent naturalist, that fry of the sprat may be seen in multitudes in July and August, when they are of the length of two inches. We know, also, that young herrings and young sprats are captured indiscriminately in the Firth of Forth in the same shoals, of the same size, and presumably of the same age. In a shoal of young herrings the sizes of the fish are exceedingly varied, ranging from three to six inches in length, and of corresponding girth; some serrated, some not; some weighing a quarter of an ounce, some nearly an ounce. Were these fish all born at once? How about the serrations? Again, a jar of whitebait from the Thames, received by the writer for examination, contained specimens of all sizes; some little more than an inch long, while some were two or three inches. How old would these be? and were some of them serrated and others not? The bellies being all decayed, that point could not be determined in any of the specimens received. February and March are the great months for the spring races of herring to spawn; so that the specimens of whitebait just alluded to (there were other fishes besides the young of the herring and the sprat) would be about three months old; and by November they would in all probability be grown to the average size of sprats. Young herrings of the Moray Firth, spawned in August, can sometimes be seen inshore about November, looking exactly like whitebait.

The *blanquette* of Normandy and Brittany did not look when examined—if it *was* it that was placed before me—to be any other fish than our sprat in an early stage of its life. It is curious that whitebait exhibit many of the characteristics of the sprat, and particularly the strongly serrated abdomen. That peculiar mark is held by some naturalists as good proof that sprats never

become herrings of any kind ; if so, the same argument must likewise hold good against the whitebait being the young of the herring ; yet it is remarkable that the number of vertebræ of both fishes, *i.e.*, the common herring and a portion of the whitebait, are the same, namely, fifty-six, as are also the formulæ of the various fin-rays. But little weight need be laid on this latter point ; few writers give the same figures about the fin-rays ; and as there are different kinds of herrings, and different races of each kind, it is probable that there will be differences in the number of fin-rays. What is harder to understand is the fact that the vertebræ differ also ; these run from forty-seven in the sprat to fifty-six in the common herring, different numbers having been found in the same race of herring. But whilst it may be admitted, for the sake of argument, that the smaller number might increase—*i.e.*, that sprats with forty-eight vertebræ *might* grow into herring with fifty-six vertebræ—it is quite clear that whitebait with fifty-six vertebræ will never grow into sprats with forty-eight vertebræ !

I could analyse the natural history of many other fish, but the result in all cases is nearly the same, and ends in a repeated expression that what we require as regards all fish is the date of their period of reproduction ; all other information, without this great fact, is comparatively unimportant. It is difficult, however, to obtain any reliable information on the natural history of fish either by way of inquiry or by means of experiments. Naturalists cannot live in the water, and those who live on it, and have opportunities for observation, have not the necessary ability to record, or at any rate to generalise what they see. No two fishermen, for instance, will agree on any one point regarding the animals of the deep. I have examined many intelligent fishermen during the last ten years, and few of them have any real knowledge regarding the habits of the fish which it is their business to capture. As an instance of fishermen's knowledge, one of that body recently repeated to me the old story of the migration of the herring, holding that the herring comes from Iceland to Great Britain in order to spawn, and that the sprat goes to the same icy region that it may fulfil the same instinct !

It is a very common error that all fish are migratory. Some fishermen, and naturalists as well, picture the haddock and the herring as being afflicted with perpetual motion—perpetual wanderers from sea to sea and shore to shore. The migratory instinct in fish, in my opinion, is somewhat limited. They do move

about without doubt, but not farther than from their feeding-ground to their spawning-ground—probably from deep to shallow water. As has been already stated, fish must live beside their food. Some plan of taking fish other than the present must speedily be devised ; for now we only capture them—and I take the herring as an example—over their spawning-ground, when they are in the worst possible condition, their whole flesh-forming or fattening power having been bestowed on the formation of the milt and roe. I repudiate altogether this iteration of the periodical wandering instincts of the finny tribes. There are great fish colonies in the sea, in the same way as there are great seats of population on land, and these colonies are stationary, having, comparatively speaking, only a limited range of water in which to live and die. Adventurous individuals of the fish world occasionally roam far away from home, and speedily find themselves in a warmer or colder climate, as the case may be ; but, speaking generally, as the salmon returns to its own waters, so do sea fish keep to their own colony. All they seem to need is a rallying point—thus at any place where there is a wrecked ship in the water, a sand-bank, or a chain of rocks, certain kinds of fish will there be found assembled. Our larger shoals of fish, which form money-yielding industries, are of wonderful extent, and must have been gathering and increasing for ages, having a population multiplied almost beyond belief. Century after century must have passed away as these colonies grew in size, and were subjected to all kinds of influences, evil or good : at times decimated by enemies, or perhaps attacked by mysterious diseases, that killed the fish in tens of thousands. Schools or shoals of fish, when they become of an extent that will admit of constant fishing, must have been forming during long periods of time ; for we know that, despite the wonderful fecundity of all kinds of sea-fish, the expenditure of both seed and life is something tremendous. We may rest assured that, if a female cod-fish yields its roe by millions, a balancing power exists in the water that prevents the bulk of the eggs from coming to life, or at any rate from reaching maturity. If it were not so, how came it, when there was no fish commerce, and when man only killed the denizens of the sea for the supply of his individual wants, that our waters were not, so to speak, impassable from a superfluity of fish ?

EARLY COMMERCE IN FISH.

Early Fish Commerce—Sale of Fresh-water Fish—Influence of Rapid Transit on the Fisheries—Ancient Fishing Industries—The Dutch Herring Fishery—Comacchio—the Art of Breeding Eels—Progress of Fishing in Scotland—Newfoundland Fisheries—The Greenland Whale Fishing—Specialities of different Fishing Towns.

THERE was a time when man only killed the denizens of the deep in order to supply his own immediate wants, and it is very much to be regretted, in the face of the extensive fish commerce now carried on, that no reliable documents exist from which to write a consecutive history of the rise and progress of fishing.

In the absence of precise information, it may be allowed us to guess that even during the far back ages fish was esteemed as an article of diet, and formed an important contribution to the food resources of such peoples as had access to the sea, or who could obtain the finny inhabitants of the deep by purchase or barter. In the Old and New Testaments, and in various ancient profane histories, fish and fishing are mentioned very frequently; and in what may be called modern times a few scattered dates, indicating the progress of the sea fisheries, may, by the exercise of great industry and research, be collected; but these are not in any sense consecutive, or indeed very reliable, so that we are, as it were, compelled to imagine the progress of fish commerce, and to picture in our mind's eye its transition from the period when the mere satisfaction of individual wants was all that was cared for, to a time when fish began to be bartered for land goods—such as farm, dairy, and garden produce—and to trace, as we best can, that commerce through those obscure periods to the present time, when our fisheries form a prominent outlet for capital, have become a large source of revenue, and are attracting, because of these qualities, an amount of attention never before bestowed upon them.

Fish commerce being an industry naturally arising out of the immediate wants of mankind, has unfortunately, as regards the article dealt in, been invested with an amount of exaggeration

that has no parallel in other branches of industry. Blunders perpetrated long ago in Encyclopædias and other works, when the life and habits of all kinds of fish, from the want of investigation, were but little understood, have been, with those additions which under such circumstances always accumulate, handed down to the present day, so that even now we are carrying on some of our fisheries on altogether false assumptions, and in a few cases perhaps killing the goose for the sake of the golden egg: in other words, never dreaming that there will be a fishing to-morrow, which must be as important, or even more important, than the fishing of to-day, beyond which the fisher class as a rule never look.

It is curious to note that there was in some countries a commerce in fresh-water fish long before the food treasures of the sea were broken upon. This is particularly noticeable in our own country, and is vouched for by many authorities both at home and abroad. We can all imagine also, that in the pre-historic or very early ages, when the land was untilled and virgin, and the earth was undrained, there were sources for the supply of fresh-water fish that do not now exist in consequence of the enhanced value of land. At the period to which I have been alluding there was a much greater water surface than there is now—rivers were broader and deeper, and so also were our lakes and marshes. In those early days, although not so early as the remote uncultivated age of which I have spoken, there were great inland stews populous with fish, especially in connection with monasteries and other religious houses, many examples of which, in their remains, are still to be seen in England or on the Continent. In fact, fish commerce, despite many curious industries connected with the productiveness of the fisheries, was not really developed till a few years ago, when the railway system of carriage began. Even up to the time of George Stephenson commerce in fish was generally speaking a purely local business, except in so far as the fishwives could extend the trade by carrying the contents of their husbands' boats inland, in order, as in the still more primitive times, to barter the fish for other produce. The fishermen of Comacchio, for instance, still cure their eels, not having the means of sending them so rapidly into the interior of Italy as would admit of their being eaten fresh. Scotch salmon in the beginning of the present century was nearly all kippered or cured as soon as caught, because the demand for the fresh fish was only local, and

therefore limited. With the discovery that salmon packed in ice could be kept a long time fresh, the trade began to extend and the price to rise. This discovery, which exercised a very important influence on the value of our salmon-fisheries, was made by a country gentleman of Scotland, Mr. Dempster of Dunnichen, in the year 1780. Steamboat and railway transit, when they became general, at once converted salmon into a valuable commodity; and such is now the demand, from facility of transport, that this particular fish, from its great individual value, has occasionally been in danger of being exterminated through the greed of the fishery tenants.

The network of railways which now embrace the land has conferred upon our inland towns, so far as fish is concerned, all the advantages of the coast. For instance, the fishermen of Prestons send more of their fish to Manchester than to Edinburgh, which is only nine miles distant: indeed our most landward cities are comparatively well supplied with fresh fish and crustacea, while at the seaside these delicacies are not at all plentiful. The Newhaven fishwife is a common visitant in many of our larger Scottish inland towns, being able by means of the railways to make profitable journeys; indeed, one consequence of the extension of our railways has undoubtedly been to add enormously to the demand for sea produce, and to excite the ingenuity of our seafaring population to still greater cunning and industry in the capture of all kinds of fish. In former years, when a large haul of fish was taken there was no means of despatching them to a distance, neither was there a resident population to consume what was caught. Railways not being then in existence, the conveyance inland was too slow for such a perishable commodity as fish, while visitors to the seaside were also rarer than at present. The want of a population to eat the fish no doubt aided the comfortable delusion of our supplies being inexhaustible. But it is now an undoubted fact, that with railways branching to every pier and quay, our densely-populated inland towns are often better supplied with fish than the villages near where they are caught—a result of that keen competition which has at length become so noticeable where fish, oysters, or other sea delicacies are concerned. The high prices now obtained form an inducement to fishermen to take from the water all they can get, whether the fish be ripe for food or not. A practical fisherman, whom I have often consulted on these topics, says that forty-five years ago the slow system of carriage was a sure pre-

ventitive of over-fishing, as fish, to be valuable for table purposes, require to be fresh. "It's the railways that has done all the mischief, sir, depend on that; and as for the fishing, sir, it's going on at such a rate that there will very soon be a complete famine. I've seen more fish caught in a day, sir, with a score of hooks on a line than can now be got with eight thousand!"

All the ancient fishing industries, whether those that still exist or those that are extinct, except in their remains, bear traces of the times in which they originated. Pisciculture (which I shall describe at some length by and by) originated at a very ancient period, and was chiefly resorted to in connection with fresh-water fishes—the ova of such being most readily obtainable; or with the mollusca, as these could bear a long transport, having a reservoir of water in their shell. The sea fishers of the olden time dealt with their fish for the purpose of their being cured with salt or otherwise, simply, as has already been stated, because of the paucity of rapid land carriage and a comparatively scanty local population.

The particular fishing industry which has bulked largest in literature, and which was pursued after a systematic fashion, is, or rather was, that of the Dutch, for Holland does not now make so large a mark on the waters as she was wont to do, being at present surpassed in fishing enterprise by Scotland and other countries. The particular fish coveted by the Dutch people was the herring, and I have had the pleasure of examining a set of engravings procured in Amsterdam, which convey a graphic idea of the great importance that was attached by the Dutch themselves to their herring-fishery. This series of sixteen peculiarly Dutch plates begins at the beginning of the fishery, as is indeed proper it should, by showing us a party busy at a sea-side cottage knitting the gerring nets; one or two busses are seen in the distance busy at work. We are then shown, on the banks of one of the numerous Dutch canals, a lot of quaint-looking coopers engaged in preparing the barrels, while next in order comes a representation of the preparing and victualing of the buss, which is surrounded by small boats, and crowded with an active population all engaged in getting the vessel ready for sea—barrels of provisions, breadths of netting, and various necessities, are being got on board. Then follow plates, of which the foregoing is a specimen, showing us the equipment of various other kinds of boats, which again are succeeded by a view of the busses among the shoals of herring, the big mast

struck, most of the sails furled, and the men busy hauling in the nets, which are as is fitting in a picture, laden with fish. Various other boats are also shown at work, as the great hoy, a one-masted vessel, that is apparently furnished with a seine-net, and the great double shore or sea-boar, which is an open boat. Then we have the herring-buss coming gallantly into the harbour, with its sails all set and its flags all flying—its hull deep in the water, which seems to frolic lovingly round its prow as if glad at its safe return. Next, of course, there is a scene on the shore, where the pompous-looking curer and his servants are seen congratulating each other amid the bustle of surrounding commerce and labour; dealers, too, are figured in these engravings, with their wheelbarrows drawn by dogs of unmistakable Dutch build, and there are also to be seen in the picture many other elements of that industry peculiar to all fishing towns, whether ancient or modern.

The next scene of this fishing panorama is the herring banquet or feast, where the king, or mayhap the rich owner of a fleet of busses, sits grandly at table, with his wife and daughter, attended by a butler and a black footman, partaking of the first fruits of the fishery. After this follows a view of the fishmarket, with portraits of the fishwives, and altogether thoroughly indicative of their peculiar way of doing business, which is always the same, whether the scene be laid in ancient Holland or in modern Billingsgate. Next comes a picture of the various buyers of the commodity on their way home, of course by the side of a canal, with their purchases of deep-sea, shore, state, and red herrings. Then follows a smoking-house, partially obscured by wreaths of smoke, where the herrings are being red-ed; and the series is appropriately wound up with a tableau representing the important process of repairing the damaged nets—the whole conveying a really graphic, although not very artistic, delineation of this highly characteristic Dutch industry. A few plates illustrative of the whale-fisheries of Holland are appended to the series I have been describing—for whale-fishing in the seas of Greenland was also in those days one of the industries of the hardworking Dutch.

The old saying that "Amsterdam is built on herring bones," was frequently used to symbolise the fishing power of Holland. It is thought that the industry of the Dutch people was first drawn to the value of the sea fisheries by the settlement of some Scottish fishermen in their country. I cannot vouch for the truth of

this statement as to the Scottish emigration, but it was a Fleming who first discovered the virtues of pickled herrings, and it is also known that the capture of the herring was a chief industry on the sea-board of all the Low Countries, and it is likewise instructive to learn that at a time when our own fisheries were very much undeveloped the Dutch people found our seas to be a mine of gold, so productive were they in fish, and so famous did the Dutch cure of herrings become. We are not called on, however, to credit all the stories of miraculous draughts taken, and store of wealth garnered up, by the plodding Hollanders. We must bear in mind that when the Dutch began to fish, the seas as a field of industry were nearly virgin, and that the people had at one time this great source of wealth all to themselves. At that particular period, likewise, there was no limit to the supply, the fishermen having but to dip their nets in the water in order to have them filled. No wonder, therefore, that the fisheries of Holland grew into a prominent industry, and became at one time the one absorbing hobby of the nation. Large fleets of Busses were fitted out and manned, till in time the Dutch came to be reputed the greatest fishers in the world. But great as was the fishing industry of those days in Holland, and industrious as the Dutch undoubtedly were, it is evident that there has been a considerable amount of exaggeration as to the results, more especially in regard to the enormous quantities of fish said to have been captured and cured. But whatever this total might be was not of great consequence. The mere quantity of fish taken is perhaps, although a considerable one, the smallest of the many benefits conferred on a nation by an energetic pursuit of its fisheries. The fishermen must have boats, and these must be fitted with sails, rigging, etc.; moreover, the boats must be manned by an efficient crew; then the curing and sale of the fish give employment to a large number of people as well; whilst the articles of cure—as salt, barrels, etc.—must of necessity be largely provided, and are all of them the result of some kind of trained industry: and these varied circumstances of demand combine to feed the particular industrial pursuit I am describing. But the fisheries provide, besides, a great nursery for seamen, which is, perhaps, in a country like ours, having a powerful navy, the greatest of all the benefits conferred.

I have taken pains to collate as many of the figures of the Dutch fishery as I could collect during an industrious search, and I find that, in the zenith of its prosperity, after the procla-

mation of the independence of the States of Holland, three thousand boats were employed in her own bays, while sixteen hundred herring busses fished industriously in British waters, and eight hundred larger vessels prosecuted the cod and whale fisheries at remote distances. In the year 1603 we are informed that the Dutch sold herrings to the amount of £4,759,000, besides what they themselves consumed. We are also told that in 1618 they had twelve thousand vessels engaged in this branch of the fishery, and that these ships employed about two hundred thousand men. It must have been a splendid sight, on every 24th of June, to witness the departure of the great fleet from the Texel; and as most of the Dutch people were more or less interested in the prosperity of the fishery, either as labourers or employers of labour, there would be no lack of spectators on these occasions. The Wick herring drave of twelve hundred boats used to be an industrial sight of no common kind, but it could never compare with the picturesque fishing fleet of Holland, as it sailed away from the river Texel about three hundred years ago.

Long before the organization of the Dutch fisheries there existed a quaint colony of Italian fisher people on the borders of a more poetic water than the Zuyder Zee. I allude to the eel-breeders of Comacchio on the Adriatic. This particular fishing industry is of very considerable antiquity, as we have well-authenticated statistics of its progress, extending back over three centuries. The lagoons of Comacchio afford a curious example of what may be done by design and labour. This place was at one time a great unproductive swamp, about one hundred and forty miles in circumference, accessible to the waves of the sea, where eels, leeches, and the other inhabitants of such watery regions, sported about unmolested by the hand of man; and its inhabitants—the descendants of those who first populated its various islands—isolated from the surrounding civilization, and devoid of ambition, have long been contented with their obscure lot, and have even remained to this day without establishing any direct communication with surrounding countries.

The precise date at which the great lagoon of Comacchio was formed into a fish-pond is not known, but so early as the year 1229 the inhabitants of the place—a community of fishers as quaint, superstitious, and peculiar as those of Buckie on the Moray Firth, or any other ancient Scottish fishing port—proclaimed Prince Azzo d'Este Lord of Comacchio; and from

the time of this appointment the place grew in prosperity, and the fisheries after that date began to assume an organisation and design which had not before that time been their characteristic. The waters of the lagoon were dyked out from those of the Adriatic, and a series of canals and pools were formed suitable for the requirements of the peculiar fishery carried on at the place, all of which operations were greatly facilitated by the Reno and Volano mouths of the Po forming the side boundaries of the great swamp ; and, as a chief feature of the place, the marvellous fish labyrinth celebrated by Tasso still exists.

Without being technical, we may state that the principal entrances to the various divisions of the great pond—and it is divided into many stations—are from the two rivers. A number of these entrances have been constructed in the natural embankments which dyke out the waters of the lagoon. Bridges have also been built over all these trenches by the munificence of various Popes, and very strong flood-gates, worked by a crank and screw, are attached to each, so as to regulate the migration of the fish and the entrance and exit of the waters. A very minute account of all the varied hydraulic apparatus of Comacchio would only weary the reader ; but I may state generally, and I speak on the authority of M. Coste, that these flood-gates place at the service of the fish-cultivators about twenty currents, which allow the salt waters of the lagoon to mingle with the fresh waters of the river. Then, again, the waters of the Adriatic are admitted to the lagoon by means of the Grand Palotta Canal, which extends from the port of Magnavacca right through the great body of the waters, with branches stretching to the chief fishing stations which dot the surface of this inland sea, so that there are about a hundred mouths always ready to vomit into the lagoon the salt water of the Adriatic.

The entire industry of this unique place is founded on a knowledge of the natural history of the particular fish which is so largely cultivated there—viz. the eel. Being a migratory fish, the eel is admirably adapted for cultivation, and being also very prolific and of tolerably rapid growth it can be speedily turned into a source of great profit. About the end of the sixteenth century we know that the annual income derived from eel-breeding in the lagoons was close upon £12,000—a very large sum of money at that period. No recent statistics have been made public as to the money derived from the eels of Comacchio,

but I have reason to know that the sum has not in any sense diminished during late years.

The inhabitants of Comacchio seem to have a very correct idea of the natural history of this rather mysterious fish. They know exactly the time when the animal breeds, which, as well as the question how it breeds, has in Britain been long a source of controversy, as I have already shown ; and these shrewd people know very well when the fry may be expected to leave the sea and perform their *montee*. They can measure the numbers, or rather estimate the quantity, of young fish as they ascend into the lagoon, and consequently are in a position to know what the produce will eventually be, as also the amount of food necessary to be provided, for the fish-farmers of Comacchio do not expect to fatten their animals out of nothing. However, they go about this in a very economic way, for the same water that grows the fish also grows the food on which they are fed. This is chiefly the aquadelle, a tiny little fish which is contained in the lakes in great numbers, and which, in its turn, finds food in the insect and vegetable world of the lagoons. Other fish are bred as well as the eel—viz. mullet, plaice, etc. On the 2nd day of February the year of Comacchio may be said to begin, for at that time the *montee* commences, when may be seen ascending up the Reno and Volano mouths of the Po from the Adriatic a great series of wisps, apparently composed of threads, but in reality young eels ; and as soon as one lot enters, the rest, with a sheeplike instinct, follow their leader, and hundreds of thousands pass annually from the sea to the waters of the lagoon, which can be so regulated as in places to be either salt or fresh as required. Various operations connected with the working of the fisheries keep the people in employment from the time the entrance-slues are closed, at the end of April, till the commencement of the great harvest of eel-culture, which lasts from the beginning of August till December. The manner of life led by the people of Comacchio will be found detailed at some length under the title of "The Fisher Folks" in another part of the present volume.

No country has, taking into account size and population, been more industrious on the seas than Scotland—the most productive fish of that country having been the herring. There is no consecutive historical account of the progress of the herring-fishery. The first really authentic notice we have of a trade in herrings is nine hundred years old, when it is recorded that the

Scots sold herrings to the people of the Netherlands, and we have some indications that even at that early period a considerable fishery for herrings existed in Scotland ; and even prior to this time Boethius alludes to Inverlochy as an important seat of commerce, and persons of intelligence consider that town to have been a resort of the French and Spaniards for the purchase of herring and other fishes. The pickling and drying of herrings for commerce were first carried on by the Flemings. This mode of curing fish is said to have been discovered by William Benkelen of Biervlet, near Sluys, who died in 1397, and whose memory was held in such veneration for that service that the Emperor Charles V. and the Queen of Hungary made a pilgrimage to his tomb. We have also incidental notices of the herring-fishery in the records of the monastery of Evesham, so far back as the year 709, and the tax levied on the capture of herrings is noticed in the annals of the monastery of Barking as herring-silver. The great fishery for herrings at Yarmouth dates from the earliest Anglo-Saxon times, and at so early a period as the reign of Henry I. it paid a tax of 10,000 fish to the king. We are told that the most ancient records of the French herring-fishery are not earlier than the year 1020, and we know that in 1088 the Duke of Normandy allowed a fair to be held at Fecamp during the time of this fishery, the right of holding it being granted to the Abbey of the Holy Trinity. The Yarmouth fishery, even in these early times, was a great success—as success was then understood. Edward III. did all he could to encourage the fishery at that place. In 1357 he got his Parliament to lay down a body of laws for the better regulation of the fisheries, and the following year sixty lasts of herring were shipped at Portsmouth for the use of his army and fleet in France. In 1635 a patent was granted to Mr. Davis for gauging red-herrings, for which Yarmouth was famed thus early, at a certain price per last ; his duty was, in fact, to denote the quality of the fish by affixing a certain seal ; this, so far as we know, is the first indication of the brand system. His Majesty Charles II., being interested in the fisheries, visited Yarmouth in company with the Duke of York and others of the nobility, when he was handsomely entertained, and presented with four golden herrings and a chain of considerable value.

Several of the kings of Scotland were zealous in aiding the fisheries, but the death of James V. and the subsequent religious and civil commotions put a stop for a time to the pro-

gress of this particular branch of trade, as well as to every other industrial project of his time. In 1602 his successor on the throne, James VI., resumed the plans which had been chalked out by his grandfather. Practical experiments were made in the art of fishing, fishing-towns were built in different parts of the Highlands, and persons well versed in the practice were brought to teach the ignorant natives; but as the Highlanders were jealous of those "interlopers," very slow progress was made; and, again, the course of improvement was interrupted by the king's accession to the throne of England and the union of the two Crowns. During the remainder of James's reign little progress was made in the art of fishing, and we have to pass over the reign of Charles I. and wait through the troublous times of the Protectorate till we have Charles II. seated on the throne, before much further encouragement is decreed to the fisheries. Charles II. aided the advancement of this industrial pursuit by appointing a Royal Council of Fishery, in order to the establishment of proper laws and regulations for the encouragement of those engaged in this branch of our commerce.

After this period the British trade in fish and the knowledge of the arts of capture expanded rapidly. It is said, as I have already stated, that during our early pursuit of the fishery the Dutch learned much from us, and that, in fact, while we were away founding the Greenland whale-fishery, the people of Holland came upon our seas and robbed us of our fish, and so obtained a supremacy in the art that lasted for many years. At any rate, whatever the Dutch accomplished, we were particularly industrious in fishing; our seas were covered with busses of considerable tonnage—the average being vessels of fifty tons, with a complement of fourteen men and a master. The mode of fishing then was to sail with the ship into the deep sea, and then, leaving the vessel as a rendezvous, take to the small boats, and fish with them, returning to the large vessel to carry on the cure. The same mode of fishing, with slight modifications, is still pursued at Yarmouth and some other places in England.

Much has also been written from time to time about the great cod-fishery of Newfoundland: it has been the subject of innumerable treatises, Acts of Parliament, and other negotiations, and various travellers have illustrated the natural products and industrial capabilities of these North American seas. The cod-fishery of Newfoundland is undoubtedly one of the greatest

fishing industries the world has ever seen, and has been more or less worked for three hundred and sixty years. Occasionally there is a whisper of the cod grounds of Newfoundland being exhausted, and it would be no wonder if they were, considering the enormous capture of that fish which has constantly been going on during the period indicated, not only by means of various shore fisheries, but by the active American and French crews that are always on the grounds capturing and curing. Since the time when the Indian lay over the rocks and transfixed the codfish with his spear, till now, when thousands of ships are spreading their sails in the bays and surrounding seas, taking the fish with ingenious instruments of capture, myriads upon myriads of valuable cod have been taken from the waters, although to the ordinary eye the supply seems as abundant as it was a century ago. When my readers learn that the great bank from whence is obtained the chief supply of codfish is nearly six hundred miles long and over two hundred miles in breadth, it will afford a slight index to the vast total of our sea wealth and to the enormous numbers of the finny population of this part of our seas, and the population of which, before it was discovered, must have been growing and gathering for centuries; but when it is further stated—and this by way of index to the extent of this great food-wealth—that Catholic countries alone give something like half a million sterling every year for the produce of these North American seas, the enormous money value of a well-regulated fishery must become apparent even to the most superficial observer of facts and figures.

Another fishing industry which has bulked large in the annals of the sea is the whale-fishery. At one time a goodly number of British vessels were fitted out in order to follow this dangerous pursuit in the Arctic Seas, and many a thrilling narrative has been founded on the adventures of enterprising whalers. This fishery has fallen off very much of late years, both as regards the pursuit of the "right" or Greenland whale, and also in the case of the sperm whale, the capture of which used to be an "enterprise of great pith and moment" in America, the headquarters of the fishery being situated at New Bedford. It is a good thing that the invention of gas has superseded in a great measure our dependence on the whale; and the discovery of other lubricants, vegetable and mineral, suitable for machinery, has rendered us tolerably independent of the Leviathan of the deep. Although this particular fishing industry may be

said to be nearly extinct, it was at one time of considerable importance, at least to Scottish commerce.

To come down to the present time, it is pleasant to think that the seas of Britain are crowded with many thousand boats, all gleaning wealth from the bosom of the waters. As one particular branch of sea industry becomes exhausted for the season another one begins. In spring we have our white fisheries; in summer we have our mackerel; in autumn we have the great herring-fishery; then in winter we deal in pilchards and sprats and oysters; and all the year round we trawl for flat fish or set pots for lobsters, or do some other work of the fishing—in fact, we are continually day by day despoiling the waters of their food treasures. When we exhaust the inshore fisheries we proceed straightway to the deeper waters. Hale and strong fishermen sail many a long mile to the white-fishing grounds, whilst old men potter about the shore, setting nets with which to catch crabs, or ploughing the sand for prawns. At different places we can note the specialties of the British fisheries. Off Aberdeenshire we can follow the greatest herring-fleet in the world; at Cornwall, again, we can view the pilchard-fishery; at Great Grimsby we can see the cod-fleet; at Hull there is wealth of trawlers; at Whitstable we can make acquaintance with the oyster-dredgers; and at the quaint fishing-ports on the Moray Firth, to be afterwards described, we can witness the manufacture of “Finnan haddies,” as at Yarmouth we can take part in the making of bloaters; and all round our coasts we can still see women and children industriously gathering shell-fish for bait, or performing other functions connected with the industry of the sea—repairing nets, baiting the lines, or hawking the fish, for the fisherwomen are true helpmates to their husbands. At certain seasons everything that can float in the water is called into requisition—little cobbles, gigantic yawls, trig schooners, are all required to aid in the gathering of the sea harvest. Thousands of people are employed in this great industry; betokening that a vast population have chosen to seek bread on the bosom of the great deep.

NATURAL AND ECONOMIC HISTORY OF THE
HERRING.

PART I.

Overfishing of the Herring—The Old Theory of Migration—Geographical Distribution of the Herring—Mr. John Cleghorn's Ideas of the Natural History of the Herring—Mr. Mitchell on the National Importance of that Fish—Commission of Inquiry into the Herring-Fishery—Growth of the Herring—The Sprat—Should there be a Close-time?—Caprice of the Herring.

THE common herring is one of our most beautiful and abundant fishes. It is taken throughout the year in vast quantities, thus affording a plentiful supply of cheap and wholesome food to all classes, whilst its capture and cure afford remunerative employment to a large body of industrious people. It is greatly to be regretted, therefore, that frequent fluctuations in the quantity caught have given occasion for well-grounded fears of an ultimate exhaustion of some of our largest shoals, or at all events of so great a diminution of their producing power as probably to render one or two of the best fisheries unproductive. This is nothing new, however, in the history of the herring-fishery: various places can be pointed out, which, although now barren of herrings, were formerly frequented by large shoals, that, from overfishing or other causes, have been dispersed.

This supposed overfishing of the herring has resulted chiefly from our ignorance of the natural history of that fish—ignorance which has long prevailed, and which we are only now beginning to overcome. Indeed, much as the subject has been discussed during the last ten years, and great as the light is that has been thrown on the natural and economic history of our fish, considering the elemental difficulty which stands in the way of perfect observation, there are yet persons who believe the old theories and fanciful romances pertaining to the lives of sea animals. We occasionally here of the great sea-serpent; the impression of St. Peter's thumb is still pointed out on the

haddock ; "Moby Dick," a Tom Sayers among fighting whales, still ranges through the *squid* fields of the Pacific Ocean ; and I know an old fisherman who once borrowed a comb from a polite mermaid !

Not very long ago, for instance, the old theory of the migration of the herring to and from the Arctic Regions was gravely revived in an unexpected quarter, as if that romance of fish-life was still believed by modern naturalists to be the chief episode in the natural history of *Clupea harengus*. The original migration story—which was invented by Pennant, or rather was constructed by him from the theories of fishermen—old as it is, is worthy of being briefly recapitulated, as affording a good point of view for a consideration of the natural and economic history of the herring as now ascertained : it was to the effect that in the inaccessible seas of the high northern latitudes herrings were found in overwhelming abundance, securing within the icy Arctic Circle a bounteous feeding-ground, and at the same time a quiet and safe retreat from their numerous enemies.

At the proper season, inspired by some commanding impulse, vast bodies of this fish gathered themselves together into one great army, and in numbers far exceeding the power of imagination to picture departed for the waters of Europe and America. The particular division of this great *heer*, which was destined annually to repopulate the British seas, and afford a plenteous food-store for the people, was said to arrive at Iceland about March, and to be of such amazing extent as to occupy a surface more than equal to the dimensions of Great Britain and Ireland, but happily subdivided, into numerous battalions five or six miles in length and three or four in breadth, each line or column being led, according to the ideas of fishermen, by herrings (probably the *Alice* and *Twaite shad*) of more than ordinary size and sagacity. These heaven-directed strangers were next supposed to strike on the Shetland Islands, where they divided of themselves, as we are told ; one division taking along the west side of Britain, whilst the other took the east side, the result being an adequate and well-divided supply of this fine fish in all our larger seas and rivers, as the herrings penetrated into every bay, and filled all our inland lochs from Wick to Yarmouth. Mr. Pennant was not contented with the development of this myth, but evidently felt constrained to give *éclat* to his invention by inditing a few moral remarks just by way of a *tag*. "Were we," he says, "inclined to consider the migration of the herring in a

moral light, we might reflect with veneration and awe on the mighty power which originally impressed on this useful body of His creatures the instinct that directs and points out the course that blesses and enriches these islands, which causes them at certain and invariable times to quit the vast polar depths, and offer themselves to our expectant fleets. This impression was given them that they might remove for the sake of depositing their spawn in warmer seas, that would mature and vivify it more assuredly than those of the frigid zone. It is not from defect of food that they set themselves in motion, for they come to us full and fat, and on their return are almost universally observed to be lean and miserable."

Happily, the naturalists of the present day know a vast deal more of the natural history of the herring than Mr. Pennant ever knew, and on the authority of the most able enquirers it may be taken for granted that the herring is a local and not a migratory fish. It has been repeatedly demonstrated that the herring is a native of our immediate seas, and can be caught all the year round on the coasts of the three kingdoms. The fishing begins at the island of Lewis, in the Hebrides, in the month of May, and goes on as the year advances, till in July it is being prosecuted off the coast of Caithness; while in autumn and winter we find large supplies of herrings at Yarmouth; and there is a winter fishery in the Firth of Forth: moreover, this fish is found in the south long before it ought to be there, if we were to believe in Pennant's theory. It has been deduced, from a consideration of the figures of the annual takes of many years, that the herring exists in distinct races, which arrive at maturity month after month; and it is well known that the herrings taken at Wick in July are quite different from those caught at Dunbar in August or September: indeed, I would go further, and say that even Wick has each month its changing shoal, and that as one race ripens for capture another disappears, having fulfilled its mission of procreation. It is certain that the herrings of these different seasons vary considerably in size and appearance; and it is well known that the herrings of different localities are marked by distinctive features. Thus, the well-known Lochfyne herring is essentially different in its flavour from that of the Firth of Forth, and those taken in the Firth of Forth differ again in many particulars from those caught off Yarmouth.

The herring, it is asserted, never ventures far from the spot where

it is taken, and its condition, when it is caught, is just an index of the feeding it has enjoyed in its particular locality. The superiority in flavour of the herring taken in our great land-locked salt-water lochs is undoubted. Whether or not it results from the depth and body of water, from more plentiful marine vegetation, or from the greater variety of land food washed into these inland seas, has not yet been determined; but it is certain that the herrings of our western sea-lochs are infinitely superior to those captured in the more open sea. It is natural that the animals of one feeding locality should differ from those of another: land animals, it is well known, are easily affected by food and place; and fish, there can be no doubt, are governed by similar laws.

Moreover, as is now known, from the inquiries of the late Mr. Mitchell and other authorities on the geographical distribution of the herring, that fish has never been noticed as being at all abundant in the Arctic Regions; and the knowledge accumulated from recent investigations has dispelled many of what may be termed the minor illusions once so prevalent about the life of the herring and other fish. People, however, have been very slow to believe that fish were subject to the same natural laws as other animals. In short, seeing that the natural history of all kinds of fish has been largely mixed up with tradition or romance, it is no wonder that many have been slow to reject Pennant's pretty story about the migratory instinct of the herring, and the wonderful power of sustained and rapid travelling by which it reached and returned from our coasts. Even Yarrell wrote in a weak uncertain tone about this fish; indeed his account of it is not entitled to very much consideration, being a mere compilation, or rather a series of extracts, from other writers.

It was not till the year 1854 that anything like an authentic contradiction to Pennant's theory was obtained. Before that time one or two bold people had entertained doubts about the migration story, and thought the herring must be a local animal, from the fact of its being found on the British coasts all the year round; while one daring man said authoritatively, from personal knowledge, that herrings seldom were to be found in the Arctic seas. During the year I have mentioned, a paper, communicated to the Liverpool Meeting of the British Association by Mr. Cleghorn of Wick, directed an amount of public attention to the herring-fishery, which still continues, and which, at the time, was thought sure ultimately to result in

an authentic inquiry into the natural and economic history of that fish.

In his paper communicated to the British Association at Liverpool, Mr. Cleghorn stated that, living at Wick, the chief seat of the fishery—"the Amsterdam of Scotland" in fact—his attention had been directed to the herring-fishery by the fluctuations in the annual take. Mr. Cleghorn believes the fluctuations in the capture to be caused by "overfishing," as in the case of the salmon, the haddock, and other fish. The points brought forward by Mr. Cleghorn in order to prove his case were the following:—1. That the herring is a native of waters in which it is found, and never migrates. 2. That distinct races of it exist at different places. 3. That twenty-seven years ago the extent of netting employed in the capture of the fish was much less than what is now used, while the quantity of herrings caught was, generally speaking, much greater. 4. There were fishing stations extant some years ago which are now exhausted; a steady increase having taken place in their produce up to a certain point, then violent fluctuations, and *then* final extinction. 5. The races of herrings nearest our large cities have disappeared first; and in districts where the tides are rapid, as among islands and in lochs, where the fishing grounds are circumscribed, the fishings are precarious and brief; while on the other hand extensive seaboard having slack tides, with little accommodation for boats, are surer and of longer continuance as fishing stations. 6. From these premises it follows that the extinction of districts, and the fluctuations in the fisheries generally, are attributable to overfishing. Mr. Cleghorn's theory has undoubtedly proved the key-note to much discussion on the subject of the natural history of the herring. Before the reading of Mr. Cleghorn's statistics, the natural history of the herring was not well understood even by naturalists; so difficult is it to make observations in the laboratories of the sea. Only a few persons, till recently, were intimate with the history of this fish, and knew that, instead of being a migratory animal, as had been asserted by Anderson and Pennant, the herring was as local to particular coasts as the salmon to particular rivers.

The late Mr. J. M. Mitchell, in a paper which he read before the British Association at Oxford, settled with much care and very effectually the geographical part of the herring question. His idea also is that the herring is a native of the coast on which it is found, and that immediately after spawning the full-sized

herrings make at once for the deep waters of their own neighbourhood, where they feed till the spawning season again induces them to seek the shallow water. Mr. Mitchell gives his reasons, and states that the herrings resorting to the various localities have marked differences in size, shape, or quality; those of each particular coast having a distinct and specific character which cannot be mistaken; and so well determined are those particulars, that practical men, on seeing the herrings, can at once hit upon the locality from whence they come; as, indeed, is the case with salmon, turbot, and many other fishes and crustaceans.

On the southern coast of Greenland the herring is a rare fish; and, according to Crantz, only a small variety is found on the northern shore, nor has it been observed in any number in the proper icy seas—as it would undoubtedly have been had it resorted thither in such innumerable quantities as was imagined by the naturalists of the last century. Another proof that the herring is local to the coasts of Britain lies in the fact of the different varieties brought to our own markets. As expert fishers know the salmon of particular rivers, so do some men know the different localities of our herring from merely glancing at the fish. Experienced fishmongers can tell the different localities of the same kinds of fish as easily as a farmer can tell a Cheviot sheep from a Southdown. Thus they can at once distinguish a Severn salmon from one caught in the Tweed or the Spey, and they can tell at a glance a Lochfyne *matie* from a Firth of Forth one.

Turning now to the report of the Commissioners already referred to, we obtain some interesting information as to the spawning and growth of the herring. Upon these branches of the subject the public have hitherto been very ill informed. Yarrell's account of this particular fish is a mere compilation from Dr. M'Culloch, W. H. Maxwell, Dr. Parnell, and others, and is thus very disappointing. Again, the account in the *Naturalist's Library* is compressed into five small pages, referring chiefly to authorities on the subject, with quotations from Yarrell! It is only by searching in Blue Books, by perusing much newspaper writing of a controversial kind, and by arduous personal inquiry, as well as by making a minute study of the herring, that I have been able to complete anything like an accurate *précis* of the natural and economic history of this very plentiful fish.

As to the periods at which herrings spawn, the Commissioners inform us they met with "singularly contradictory" statements, and after having collected a large amount of valuable

evidence, *they* arrived at the conclusion that herrings spawn at two seasons of the year—viz. in the spring and autumn. They have no evidence of a spawning during the solstitial months—viz. June and December ; but in nearly all the other months gravid herrings are found, and the Commissioners assert that a spring spawning certainly occurs in the latter part of January, as also in the three following months, and the autumn spawning in the latter end of July, and likewise in the following months up to November. “Taking all parts of the British coast together, February and March are the great months for the spring spawning, and August and September for the autumn spawning.” The spawn, it may be stated in passing, is deposited on the surface of the stones, shingle, and gravel, and on old shells, at the various spawning places, and adheres tenaciously to whatever it happens to fall upon. This, as will be seen, brings us exactly back to Mr. Cleghorn’s ideas of the herring existing in races at different places and in separate bodies, and thereby rendering the recent fluctuations of the great series of shoals at Wick more and more intelligible, especially when we take into account the fact that winter shoals are now found at that place, giving rise to what may ultimately prove a considerable addition to the autumn fishery carried on there.

On the question of how long herrings take to grow, from the period of the deposition of the egg, there are various opinions, for no naturalist or practical fisherman has been able definitely to fix the time. There is reason to believe, we are told in the report, that the eggs of herrings are hatched in, at most, from two to three weeks after deposition. This is very rapid work when we consider that the eggs of the salmon require to be left for a period of ninety or a hundred days, even in favourable seasons, before they quicken into life, and that the eggs of a considerable number of fish are known to take a much longer period than three weeks to ripen. As an example of the numerous absurd statements that have been circulated about fish, the reader may study the following paragraph :—“Old fishermen about Dunbar say the way herring spawn is—first, the female herrings deposit their roe at some convenient part on sand or shingly bottom ; second, the male fish then spread their milt all over the roe to protect it from enemies, and the influence of the tide and waves from moving it about. The fishermen also say that when the young herrings are hatched they can see and swim ; the milt covering bursts open, and they are free to roam about.

Some naturalists think the roes and milts of herring are all mixed together promiscuously, and left on the sands to bud and flourish. The fishermen's idea seems to be the most likely of the two opinions."

I have had young herrings of all sizes in my possession, from those of an inch long upwards. The following are the measurements of a few of my specimens which were procured about the end of February, and not one of which had any appearance of either roe or milt, while some (the smaller fish) were strongly serrated in the abdominal line, and others as they advanced in size, lost that distinguishing mark, and were only very slightly serrated. The largest of these fish—all, be it observed, caught at one fishing time—was eight inches long, nearly four inches in circumference at the thickest part of the body, and weighed a little over two ounces. The smallest of these herring-fry did not weigh a quarter of an ounce, and was not quite three inches in length. One of them, again, that was six inches long, only weighed three-quarters of an ounce; whilst another of the same lot, four and a half inches long, weighed a quarter of an ounce exactly. I do not propose at present to enter at great length into the sprat controversy; but, if the sprat be the young of some one of the different species of herring, as I take leave to think it is, then the question of its growth and natural economy will become highly important. Some people say that the herring must have attained the age of seven years before it can yield milt or roe, whilst a period of three years has been also named as the ultimate time of this event; but there are persons who think that the herring attains its reproductive power in eighteen months, while others affirm that the fish grows to maturity in little more than half that time. If the average size of a herring may be stated as eleven and a half inches, individual fish of *Clupea harengus* have been found measuring seventeen inches, and full fish have been taken only ten inches in length, when should the example, noted above as being eight inches long, reach its full growth? and how old was it at the time of its capture? And, again, were the fish—all taken out of the same boat, be it observed, and caught in the same shoal—all of one particular year's hatching? Is this the story of the parr over again, or is it the case that the fishermen had found a shoal of mixed herrings—some being of one year's spawning, some of another? I confess to being puzzled, and may again remind the reader that my largest fish had never spawned, and had not the faintest trace of milt or roe

within it. Then, again, as to the time when herrings spawn, I have over and over again asserted in various quarters that they spawn in nearly every month of the year—an assertion which has been proved by official inquiry.

As to the place of spawning, development of the ova and other circumstances attendant on the increase of the herring, I promulgated the following opinions some years ago, and I see no reason to alter them:—The herring shoal keeps well together till the time of spawning, whatever the fish may do after that event. Some naturalists think that the shoal breaks up after it spawns, and that the herring then live an individual life, till again instinctively drawn together for the grand purpose of procreating their kind. It is quite clear, I think, that herring move into shallow water because of its increased temperature, and its being more fitted in consequence for the speedy vivifying of their spawn. The same shoal will always gather over the same spawning ground, and the fish will keep their position till they fulfil the chief object of their life. The herrings will rise buoyantly to the surface of the water after they have spawned; before that they swim deep and hug the ground. The herring, in my opinion, must have a rocky place to spawn upon, with a vegetable growth of some kind to receive the roe; shoals may of course accidentally spawn on soft ground. It is not accurately known how long a period elapses till the spawn ripens into life. I think, however, that herring spawn requires a period of twenty five days to ripen. It is known that young herrings have appeared on a spawning ground in myriads within thirty days after the departure of a shoal, and fishermen say that no spawn can be found on the ground after the lapse of three or four weeks from the visit of the gravid shoal—that the eggs in fact having come to life, the tiny fish are swimming about.

It is generally known that the sprat (*Clupea sprattus*) is a most abundant fish. The fact of its great abundance has induced a belief that it is not a distinct species of fish, but is, in reality, the young of the herring. It is true that many distinguishing marks are pointed out as belonging only to the sprat—such as its serrated belly, the relative position of the fins, etc. But there remains, on the other side, the very striking fact of the sprat being rarely found with either milt or roe; indeed, the only case I know of this fish having been found in a condition to perpetuate its species was detailed by the late Mr. Mitchell, who exhibited before one of the learned societies of Edinburgh a pair of sprats

having the roe and milt fully developed. Dr. Dod, an ancient anatomist, says : " It is evident that sprats are young herrings. They appear immediately after the herrings are gone, and seem to be the spawn just vivified, if I may use the expression. A more undeniable proof of their being so is in their anatomy ; since, on the closest search, no difference but size can be found between them. "

After the nonsense which was at one time written about the parr, and considering the anomalies of salmon-growth, it would be unsafe to dogmatise on the sprat question. As to the serrated belly, we might look upon it as we do on the tucks of a child's frock—viz. as a provision for growth. The fin-rays of this fish have also been cited in evidence as not being the same in number as those of the herring, but as I can testify from actual counting, the fin-rays of the latter fish vary considerably, therefore the number of fin-rays is not evidence in the case. The slaughter of sprats which is annually carried on in our seas is, I suspect, as decided a killing of the goose for the sake of the golden eggs as the grilse-slaughter which is annually carried on in our salmon rivers. As was made public in the newspapers of the day, *tons* of these little fish were taken from the river Tay in 1883-4 to be sold as manure ; and it is an undoubted fact, that many so-called sprats were herrings of a tender age.

The herring is found under four different conditions :—1st, Fry or sill ; 2d, *Maties* or fat herring ; 3d, Full herring ; 4th, Shotten or spent herring. All herrings under five or six inches in length come under the first denomination. The *matie* is the finest condition in which a herring can be used for food purposes ; and if the fishery could be so arranged, that is the time at which it should be caught for consumption. At that period it is very fat, its feeding-power being all developed on its body ; the spawn is small, the growth of roe or milt not having yet demanded the whole of the nutriment taken by the fish. A full herring is one in which the milt or roe is quite developed. The *maties* develop into spawning herring with great rapidity—in the course of three months, it is said. The herrings at the spawning season come together in vast numbers, and proceed to their spawning places in the shallower and consequently warmer parts of the sea. As Gilbert White says, " The two great motives which regulate the brute creation are love and hunger ; the one incites them to perpetuate their kind, the latter induces them to preserve individuals. " In obedience to these laws the herring congregate on

our coast, for there only they find an abundant supply of food to mature with the necessary rapidity their milt and roe, as well as a sea-bottom fitted to receive their spawn ; and they are thus brought within the reach of man at what many persons consider the wrong time of their life.

As to this division of the question, it has been said that it matters not at what period you take a herring, whether it be old or young, without or with spawn ; that fish cannot again be caught, and will never spawn again ; and it is argued, therefore, that the taking of a fish in "the family way" no more prevents it from reproducing than if it had been killed in the condition of a *matie*. The same argument was used in the case of the young salmon ; and it was pertinently asked : If you kill all your grilse, where are you to find your salmon ?

The herring breeds, then, and is caught in greater or lesser quantities, during every month of the year. How is it that the time selected by fishermen for the capture of this fish corresponds with the period when it is a crime to take a salmon ? If a gravid salmon be unwholesome, is a gravid herring good for food ? Do not the same physical laws affect both of these fish ? There cannot be a doubt that at the period of spawning, this fish, as well as all other fish, is in its worst condition so far as its food-yielding qualities are concerned, because at that time of its life its whole nutritive power is exerted on behalf of its seed, and its flesh is consequently lean and unpalatable. Yet it is a great fact that the time which the herring selects to fulfil the grandest instinct of its nature is the very time appointed by man for its capture ! In fact, that is the period when herrings are at a premium ; they must be "full fish," or they cannot obtain the official brand ; in other words, *shotten* herrings are not of the same value as the others. When it is taken into account that each pair of full fish (male and female) are killed just as they are about to give us the chance of obtaining an increase of the stock to the extent say of 30,000, the ultimate effect must be to disturb and cripple the producing powers of the shoal to such a degree that it will break up and find a new breeding-ground, safe for a time perhaps from the spoliation of the greedy fishermen. The Lochfyne Commissioners gave as a reason for their non-recommendation of a close-time the fact, that were there to be a cessation from labour, the enemies of the herring so increase that the jubilee given would be nugatory. But surely there is a great want of logic in this argument ! How is it that a close-time operates so

favourably in the case of the salmon—not only a seasonal close-time, but a weekly one as well? Would not the herring, with its almost miraculous breeding-power, increase in the same ratio, or even in a greater ratio, than its enemies, especially, if, as the Commissioners tell us, and we believe, it is engaged in multiplying its kind during some ten months of the year? Are not the enemies of the herring at work during the fishing season as well as at other periods? I could understand the logic of denying a close-time on the ground that, as the herring never ceases breeding, it is impossible to fix a correct period.

One of the wonders connected with the natural history of the herring is the capricious nature of the fish. It is always changing its *habitat*, and, according to vulgar belief, from the most curious circumstances. I need not add to the necessary length of this chapter by giving a great number of instances of the capricious nature of the herring; but I must cite a few, in order to make my recapitulation of herring history as complete as possible, and at the same time it is proper to mention that superstition is brought to bear on this point. The fishermen of St. Monance, in Fife, used to remove their church-bell during the fishing season, as they affirmed that its ringing scared away the shoals of herring from the bay! It has long been a favourite and popular idea that they were driven away by the noise of gun-firing. The Swedes say that the frequent firings of the British ships in the neighbourhood of Gothenburg frightened the fish away from the place. In a similar manner and with equal truth it was said that they had been driven away from the Baltic by the firing of guns at the battle of Copenhagen! “Ordinary philosophy is never satisfied,” says Dr. M’Culloch, “unless it can find a solution for everything; and it is satisfied for this reason with imaginary ones.” Thus in Long Island, one of the Hebrides, it was asserted that the fish had been driven away by the kelp-manufacture, some imaginary coincidence having been found between their disappearance and the establishment of that business. But the kelp fires did not drive them away from other shores, which they frequent and abandon indifferently, without regard to that work. A member of the House of Commons, in a debate on a Tithe Bill in 1835, stated that a clergyman, having obtained a living on the coast of Ireland, signified his intention of taking the tithe of fish, which was, however, considered to be so utterly repugnant to their privileges and feelings, that not a single herring had ever since visited that part of the shore!

The most prominent members of the *Clupeidæ* are the common herring (*Clupea Harengus*); the sprat, or garvie (*Clupea sprattus*); and the pilchard, or gipsy herring (*Clupea pilchardus*). The other members of this family are the anchovy, and the Alice and Twaite shad; but these, although affording material for speculation to naturalists, are not of great commercial importance.

Before concluding this chapter I wish to say a few words about a point of herring economy, which has been already alluded to in connection with the special commission appointed to inquire into the trawling system—viz. as to the natural enemies of the herring, the most ruthless of which are undoubtedly of the fish kind, and whose destructive power, some people assert, dwarfs into insignificance all that man can do against the fish:—"Consider," say the Commissioners, "the destruction of large herring by cod and ling alone. It is a very common thing to find a codfish with six or seven large herrings, of which not one has remained long enough to be digested, in his stomach. If, in order to be safe, we allow a codfish only two herrings *per diem*, and let him feed on herrings for only seven months in the year, then we have 420 as his allowance during that time: and fifty codfish will equal one fisherman in destructive power. But the quantity of cod and ling taken in 1861, and registered by the Fishery Board, was over 80,000 cwts. On an average thirty codfish go to one cwt. of dried fish. Hence, at least 2,400,000 will equal 48,000 fishermen. In other words, the cod and ling caught on the Scotch coasts in 1861, if they had been left in the water, would have caught as many herring as a number of fishermen *equal to all those in Scotland, and six thousand more*, in the same year; and as the cod and ling caught were certainly not one tithe part of those left behind, we may fairly estimate the destruction of herring by these voracious fish alone as at least ten times as great as that effected by all the fishermen put together." As to only one of the numerous land enemies of the herring, the late Mr. Wilson, in his *Tour round Scotland*, calculated that the gannets or solan geese frequenting one island alone—St. Kilda—picked out of the water for their food 214 millions of herrings every summer! The shoals that can withstand these destructive agencies must indeed be vast, especially when taken in connection with the millions of herrings that are accidentally killed by the nets, and never brought ashore for food purposes. The work accomplished by these natural enemies of the herring, which has been going on during all time, does not however affect my

argument, that by the concentration on one shoal of a thousand boats per annum, with an annually-increasing net-power, we both so weaken and frighten the shoal that it becomes in time unproductive. As the late Mr. Methuen said in one of his addresses : " We have been told that we are to have dominion over the fish of the sea, but dominion does not mean extermination."

NATURAL AND ECONOMIC HISTORY OF THE HERRING.

PART II.

The herring fisheries—The Lochfyne Fishery — The Pilchard — Herring Commerce — Mr. Methuen—The Brand — The Herring Harvest — A Night at the Fishing—The Cure—The Curers—Herring Boats—Increase of Netting—The Fishery at Yarmouth.

THE fisheries for the common herring, the pilchard, and the sprat, are carried on at some place or other, all the year round ; but the great herring season is during the autumn—from August to October—when the sea is covered with boats in pursuit of that fine fish, and in some of its phases the herring-fishery assumes an aspect that is decidedly picturesque. Every little bay all round the island has its tiny fleet ; the mountain-closed lochs of the Western Highlands have each a fishery ; while at some of the more important fishing stations there are very large fleets assembled—as at Wick, Dunbar, Ardrishaig, Stornoway, Peterhead, Fraserburgh, Shetland and Anstruther. The chief curers have places of business in these towns, where they keep a large store of curing materials, and a competent staff of coopers and others to aid them in their business. Such boats as do not carry on a local fishery proceed from smaller fishing-villages to one or other of the centres of the herring trade. In fact, wherever an enterprising curer sets up his stand, there the boats gather round him ; and beside him will collect a crowd of all kinds of miscellaneous people—dealers in salt, sellers of barrel-staves, vendors of “cutch,” Prussian herring-buyers, comely girls from the inland districts to gut, and men from the Highlands anxious to officiate as “hired hands.” Itinerant ministers and revivalists also come on the scene and preach occasional sermons to the hundreds of devout Scotch people who are assembled ; and thus arises many a prosperous little town, or at least towns that might be prosperous were the finny treasures of the sea always plentiful.

As the chief herring season comes on a kind of madness seizes on all engaged, ever so remotely, in the trade ; as for those more immediately concerned, they seem to go completely "daft," especially the younger hands. The old men, too, come outside to view the annual preparations, and talk, with revived enthusiasm to their sons and grandsons about what they did twenty years ago ; the young men spread out the sails of their boats to view and repair defects ; and the wives and sweethearts, by patching and darning, contrive to make old nets "look amaisht as weel as new ;" boilers bubble with the brown *catechu*, locally called "cutch," which is used as a preservative for the nets and sails ; while along the coast old boats are being cobbled up, and new ones are being built and launched.

The scene all over the Scotch seaboard from Buckhaven to Buckie is one of active preparation, all concerned hoping for a "lucky" fishing ; "winsome" young lassies are praying for the success of their sweethearts' boats, because if the season turns out well they will be married women at its close. Curers look sanguine, and the owners of free boats seem happy. The little children too—those wonderful little children one always finds in a fishing village, striving so manfully to fill up "daddy's" old clothes—participate in the excitement : they have their winter's "shoon" and their "Sunday breeks" in perspective. At the quaint village of Gamrie, at Macduff, or Buckie, the talk of old and young, on coach or rail, from morning to night, is of herrings. There are comparisons and calculations about "crans" and barrels, and "broke" and "splitbellies," and "full fish" and "lanks," and reminiscences of great hauls of former years, and much figurative talk about prices and freights, and the cost of telegraphic messages. Then, if the present fishery be dull, hopes are expressed that the next one may be better. "Only fish this mornin'?" is the first salutation of one neighbour to another : the very infants talk about "herrin' ;" schoolboys steal them from the boats for the purpose of aiding their negotiations with the gooseberry woman : while wandering paupers are rewarded with one or two broken fish by good-natured fishers, when "the take" has been so satisfactory as to warrant such largess.

They are not all practical fishermen who go down to the sea for herring during the great autumnal fishing season. By far the larger portion of those engaged in the capture of this fish—particularly at the chief stations—are what are called "hired hands," a mixture of the farmer, the mechanic, and the sailor ;

and this fact may account in some degree for a portion of the accidents which are sure to occur in stormy seasons. Most of these men are mere labourers at the herring fishery, and have little skill in handling a boat; they are many of them farmers in the Lewis, or small crofters in the Isle of Skye. The real orthodox fisherman is a different being, and he is the same everywhere. If you travel from Banff to Bayonne you find that fishermen are unchangeable.

The men's work is all performed at sea, and, so far as the capture of the herring is concerned, there is no display of either skill or cunning. The usual mode of capturing is to take it by means of what is called a drift-net. A drift-net is an instrument made of fine twine worked into a series of squares, each of which is an inch, so as to allow plenty of room for the escape of young herrings. Nets for herrings are measured by the barrel-bulk, and each barrel will hold two nets, each net being fifty yards long and thirty-two feet deep. The larger fishing-boats carry something like two miles of these nets; some, at any rate, carry a drift which will extend over three thousand yards in length. These drifts are composed of many separate nets, fastened together by means of what is called a back-rope, and each separate net of the series is marked off by a buoy or bladder which is attached to it, the whole being sunk in the sea by means of a leaden or other weight, and fastened to the boat by a longer or shorter trail-rope, according to the depth in the water at which it is expected to find the herrings. This formidable apparatus, which forms a great perforated wall, being let into the sea immediately after sunset, floats or drifts with the tide, so as to afford the herring an opportunity of striking against it, and so becoming captured—in fact they are drowned in the nets. The boats engaged in the drift-net fishing are now of considerable size, and are strongly and carefully built: the largest, being upwards of thirty-five feet keel; with a large drift of nets and good sail and mast, a boat will now-a-days cost from two to four hundred pounds.

Another mode of fishing for herrings is known as trawling. In the west of Scotland, on Lochfyne in particular, where it is practised, it is called "trawling;" but the instrument of capture is in reality a "seine" net; and, so far as the size of the mesh is concerned, is all right.

The pilchard is generally captured by means of the seine-net, and we never hear of its being injured thereby. It is also cured in large quantities, the same as the herring, although the *modus*

operandi is somewhat different. The pilchard was at one time, like the herring, thought to be a migratory fish, but it has been found, as in the case of the common herring, to be a native of our own seas. In some years the pilchard has been known to shed its spawn in May, but the usual time is October. Their food is small crustaceous animals, as their stomachs are frequently crammed with a small kind of shrimp, and the supply of this kind of food is thought to be enormous. When on the coast, the assemblage of pilchards assumes an arrangement like that of a great army, and the vast shoal is known to be made up by the coming together of smaller bodies of that fish, and these frequently separate and rejoin, and are constantly shifting their position. The pilchard is not now so numerous as it was a few years ago, but very large hauls are still occasionally obtained.

Great excitement prevails on the coast of Cornwall during the pilchard season. Persons watch the water from the coast, and signal to those who are in search of the fish the moment they perceive indications of a shoal. These watchers are locally called "huers," and they are provided with signals of white calico or branches of trees, with which to direct the course of the boat, and to inform those in charge when they are upon the fish—the shoal being best seen from the cliffs. The pilchards are captured by the seine-net—that is, the shoal, or spot of a shoal, that has risen, is completely surrounded by a wall of netting, the principal boat and its satellites the volyer and the lurker, with the "stop-nets," having so worked as quite to overlap each other's wall of canvas. The place where the joining of the two nets is formed is carefully watched, to see that none of the fish escape at that place, and if it be too open, the fish are beaten back with the oars of some of the persons attending—about eighteen in all. In due time the seine is worked or hauled into shallow water for the convenience of getting out the fish, and it may perhaps contain pilchards sufficient to fill two thousand hogsheads. Generally speaking, four or five seines will be at work together, giving employment to a great number of the people, who may have been watching for the chance during many days. When the tide falls the men commence to bring ashore the fish, a tuck-net, worked inside of the seine being used for safety; and the large shallow dipper boats required for bringing the fish to the beach may be seen sunk to the water's edge with their burden, as successive bucketfuls are taken out of the nets and emptied into these conveyance vessels. To give the reader an idea of quantity,

as connected with pilchard-fishing, I may state that it takes nearly three thousand fish to fill a hogshead. I have read of a shoal being captured that took a fortnight to bring ashore.

Ten thousand hogsheads of pilchards have been known to be taken in one port in a day's time. The convenience of keeping the shoal in the water is obvious, as the fish need not be withdrawn from it till it is convenient to salt them. The fish are salted in curing-houses, great quantities of them being piled up into huge stacks, alternate layers of salt and fish. During the process of curing a large quantity of useful oil exudes from the heaps. The salting process is called "bulking," and the fish are built up into stacks with great regularity, where they are allowed to remain for four weeks, after which they are washed and freed from the oil, then packed into hogsheads, and sent to Spain and Italy, to be extensively consumed during Lent, as well as at other fasting times. The figures denoting the export of cured pilchards, during the twelve years from 1870 to 1881, will show the fluctuating nature of the pilchard catch; thus in 1870 only a little over 6000 hogsheads were exported, but in the following season the quantity sent off reached a total of 45,683 hogsheads. In 1872, 19,500; in 1873, 31,800; in 1874, 8,350 hogsheads respectively were shipped from the various Cornish ports. The years 1875, '76, and '77 were not so productive, the export being under 10,000 hogsheads; in 1878, '79, and '80, the quantity exported ranged from 10,309 to 11,843 hogsheads, and in 1881 it had risen to close upon 14,000 hogsheads. The hurry and bustle at any of the little Cornwall ports during the manipulation of a few shoals of pilchards must be seen, the excitement cannot be very well described. The pilchard is, or rather it ought to be, the *Sardinia* of commerce, but its place is usurped by the sprat, or garvie as we call it in Scotland, and thousands of tin boxes of that fish are annually made up and sold as sardines. I have already alluded to the sprat, so far as its natural history is concerned. It is a fish that is very abundant in Scotland, especially in the Firth of Forth, where for many years there has been a good sprat-fishery. We do not now require to go to France for our sardines, as we can cure them at home in the French style!

Sprats, whether they be young herrings or no, are very plentiful in the winter months, and afford a supply of wholesome food of the fish kind to many who are unable to procure more expensive kinds. When the fishing for garvies (sprats) was stopped a few years ago by order of Board of White Fisheries, there was quite a

sensation in Edinburgh ; and an agitation was got up that resulted in the resumption of the fishing, which is of considerable value.

Commerce in herring is entirely different from commerce in any other article, particularly in Scotland. In fact the fishery, as at present conducted, is just another way of gambling. The home "curers" and foreign buyers are the persons who at present keep the herring-fishery from stagnating, and the goods (*i.e.* the fish) are generally all bought and sold long before they are captured. The way of dealing in herring is pretty much as follows :—Owners of boats are engaged to fish by curers, the bargains being usually that the curer will take two hundred crans of herring—and a cran, it may be stated, is forty-five gallons of ungutted fish ; for these two hundred crans a certain sum per cran is paid according to arrangement, the bargain including as well a definite sum of ready money by way of bounty, perhaps also an allowance of spirits, and the use of ground for the drying of the nets. On the other hand, the boat-owner provides a boat, nets, buoys, and all the apparatus of the fishery, and engages a crew to fish ; his crew may, perhaps, be relatives and part owners sharing the venture with him, but usually a portion, at least, of the crew consists of hired men who get so much wages at the end of the season, and have no risk or profit. This is the plan followed by free and independent fishermen who are really owners of their own boats and apparatus.

It will thus be seen that the curer is bargaining for two hundred crans of fish months before he knows that a single herring will be captured ; for the bargain of next season is always made at the close of the present one, and he has to pay out at once a large sum by way of bounty, and provide barrels, salt, and other necessities for the cure before he knows even if the catch of the season just expiring will all be sold, or how the markets will pulsate next year. On the other hand, the fisherman has received his pay for his season's fish, and very likely pocketed a sum of from ten to thirty pounds as earnest-money for next year's work. Then, again, a certain number of curers, who are men of capital, will advance money to young fishermen in order that they may purchase a boat and the necessary quantity of netting to enable them to engage in the fishery—thus thirling the boat to their service, very probably fixing an advantageous price per cran for the herrings to be fished and supplied. Curers, again, who are not capitalists, have to borrow from the buyers, because to

compete with their fellows they must be able to lend money for the purchase of boats and nets, or to advance sums by way of bounty to the free boats ; and thus a rotten unwholesome system goes the round—fishermen, boatbuilders, curers, and merchants, all hanging on each other, and evidencing that there is as much gambling in herring-fishing as in horse-racing.

The whole of the commerce connected with this trade is decidedly unhealthy, and ought at once to be checked and reconstructed if there be any logical method of doing it. At a port of three hundred boats a sum of £145 was paid by the curers for “arles,” and spent in the public-houses ! More than £4000 was paid in bounties, and an advance of nearly £7000 made on the various contracts, and all this money was paid eight months before the fishing began. When the season is a favourable one, and plenty of fish are taken, then all goes well, and the evil day is postponed ; but if, as is the case in occasional seasons, the take is poor, then there comes a crash. One falls and, like a row of bricks, the others all follow. At the chief fishing stations a good many of the boats are not thoroughly free ; they are tied up in some way between the buyers and curers, or they are in pawn to some merchant who “backs” the nominal owner.

This “bounty,” as it is called, is a most reprehensible feature of herring commerce, and although still the prevalent mode of doing business, has been loudly declaimed against by all who have the real good of the fishermen at heart. Often enough men who have obtained boats and nets on credit, and hired persons to assist them during the fishery, are so unfortunate as not to catch enough of herrings to pay their expenses, and the curers by whom they are engaged to fish having retained most of the bounty money on account of boats and nets, the hired servants have frequently in such cases to go home—sometimes to a great distance—penniless. It would be much better if the old system of a share were re-introduced : in that case the hired men would at least participate to the extent of the fishing, whether it were good or bad. Boat-owners try of course to get as good terms as possible, as well in the shape of price for herrings as in bounty and perquisites. My idea is that there ought to be no “engagements,” no bounty, and no perquisites. As each fishing comes round let the boats catch, and the curers buy day by day at auction, as the fish arrive at the quay. This plan I am pleased to learn is now being more and more adopted,

and is an obvious improvement on the use and wont mode of gambling by means of "engagements" in advance.

In fact, this fishery is best described when it is called a lottery. No person knows what the yield will be till the last moment : it may be abundant, or it may be a total failure. Agriculturists are aware long before the reaping season whether their crops are light or heavy, and they arrange accordingly ; but if we are to believe the fisherman, his harvest is entirely a matter of "luck." It is this belief in "luck" which is, in a great degree, the cause of our fisher-folk not keeping pace with the times : they are greatly behind in all matters of progress ; our fishing towns look as if they were, so to speak, stereotyped. It is a woful time for the fisher-folk when the herrings fail them ; for this great harvest of the sea, which needs no tillage of the husbandman, the fruits of which are reaped without either sowing seed or paying rent, is the chief industry that the bulk of the coast population depend upon for a good sum of money. The fishing is the bank in which they have opened, and perhaps exhausted, a cash-credit ; for often enough the balance is on the wrong side of the ledger, even after the fishing season has come and gone. In other words, new boats have to be paid for out of the fishing ; new clothes, new houses, additional nets, and even weddings, are all dependent on the herring-fishery. It is notable that after a favourable season the weddings among the fishing populations are very numerous. The anxiety for a good season may be noted all along the British coasts, from Newhaven to Yarmouth ; from Crail to Wick.

The highest prices are paid for the early fish, contracts for these in a cured state being sometimes fixed as high as forty-five shillings per barrel. These are at once despatched to Germany, in the inland towns of which a prime salt herring of the early cure is considered a great luxury, fetching sometimes the handsome price of one shilling. Great quantities of cured herrings are sent to Stettin or other German ports, and so eager are some of the merchants for an early supply that in the beginning of the season they purchase quantities unbranded, through the agency of the telegraph. On those parts of the coast where the communication with large towns is easy, considerable quantities of herring are purchased fresh, for transmission to Birmingham, Manchester, and other inland cities. Buyers attend for that purpose, and send them off frequently in an open truck, with only a slight covering to protect them from the sun. It is

needless to say that a fresh herring is looked upon as a luxury in such places, and a demand exists that would exhaust any supply that could be sent ; and, were it not for the heavy rates of freight, still larger quantities would be forwarded to distant seats of population.

Having explained the relation of the curers to the trade, I must now speak of the cure—the greater number of the herrings caught on the coast of Scotland being pickled in salt ; a result originally, no doubt, of the want of speedy modes of transit to large seats of population, where herrings would be largely consumed if they could arrive in a sufficiently fresh state to be palatable. At very remote stations the quantity of herrings disposed of fresh is comparatively small, so that by far the larger portion of the daily catch has to be salted. This process during a good season employs a very large number of persons, chiefly as coopers and gutters ; and, as the barrels have to be branded, by way of certificate of the quality of their contents, it is necessary that the salting should be carefully done. As soon as the boats reach the harbour—and as the fishing is appointed to be carried on after sunset they arrive very early in the morning—the various crews commence to carry their fish to the reception-troughs of the curers by whom they have been engaged. A person in the interest of the curer checks the number of crans brought in, and sprinkles the fish from time to time with considerable quantities of salt. As soon as a score or two of baskets have been emptied, the gutters set earnestly to do their portion of the work, which is dirty and disagreeable in the extreme. The gutters usually work in companies of about five—one or two gutting, one or two carrying, and another packing. Basketfuls of the fish, so soon as they are gutted, are carried to the back of the yard, and plunged into a large tub, there to be roused and mixed up with salt ; then the adroit and active packer seizes a handful and arranges them with the greatest precision in a barrel, a handful of salt being thrown over each layer as it is put in, so that, in the short space of a few minutes, the large barrel is crammed full with many hundred fish ; all gutted, roused, and packed, in a period of not more than ten minutes. As the fish settle down in the barrel, more are added from day to day till it is thoroughly full and ready for the brand. On the proper performance of these parts of the business the quality of the cured fish very much depends.

The following detailed description of the “herring-harvest,”

as gathered in the Moray Firth, may be of interest to the general reader. It is reprinted, by permission, from a paper contributed by the author to the *Cornhill Magazine*.—

The boats usually start for the fishing-ground an hour or two before sunset, and are generally manned by four men and a boy, in addition to the owner or skipper. The nets, which have been carried inland in the morning, in order that they might be thoroughly dried, have been brought to the boat in a cart or waggon. On board there is a keg of water and a bag of bread or hard biscuit ; and in addition to these simple necessities, our boat contains a bottle of whisky which we have presented by way of paying our footing. The name of our skipper is Francis Sinclair, and a very gallant looking-fellow he is ; and as to his dress—why, his boots alone would ensure the success of a Surrey melodrama ; and neither Truefit nor Ross could satisfactorily imitate his beard and whiskers. Having got safely on board—a rather difficult matter in a crowded harbour, where the boats are elbowing each other for room—we contrive, with some labour, to work our way out of the narrow-necked harbour into the bay, along with the nine hundred and ninety-nine boats that are to accompany us in our night's avocation. The heights of Pulteneytown, which command the quays, are covered with spectators admiring the pour-out of the herring-fleet and wishing with all their hearts "God speed" to the venturers ; old salts who have long retired from active seamanship are counting their "takes" over again ; and the curer is mentally reckoning up the morrow's catch. Janet and Jeanie are smiling a kindly good-bye to "faither," and hoping for the safe return of Donald or Murdoch ; and crowds of people are scattered on the heights, all taking various degrees of interest in the scene, which is strikingly picturesque to the eye of the tourist, and suggestive to the thoughtful observer.

Bounding gaily over the waves, which are crisping and curling their crests under the influence of the land-breeze, our shoulder-of-mutton sail filled with a good capful of wind, we hug the rocky coast, passing the ruined tower known as "the Old Man of Wick," which serves as a capital landmark for the fleet. Soon the red sun begins to dip into the golden west, burnishing the waves with lustrous crimson and silver, and against the darkening eastern sky, the thousand sails of the herring-fleet blaze like sheets of flame. The shore becomes more and more indistinct, and the beetling cliffs assume fantastic and weird shapes, whilst

the moaning waters rush into deep cavernous recesses with a wild and monotonous sough, that falls on the ear with a deeper and a deeper melancholy, broken only by the shrill wail of the herring-gull. A dull hot haze settles on the scene, through which the coppery rays of the sun penetrate powerless to cast a shadow. The scene grows more and more picturesque as the glowing sails of the fleet fade into grey specks dimly seen. Anon the breeze freshens and our boat cleaves the water with redoubled speed; we seem to sail farther and farther into the gloom until the boundary-line between sea and shore becomes lost to the sight.

We ought to have shot our nets before it became so dark, but our skipper, being anxious to hit upon the right place so as to save a second shooting, tacked up and down, uncertain where to take up his station. We had studied the movements of certain "wise men" of the fishery—men who are always lucky, and who find out the fish when others fail; but our crew became impatient when they began to smell the water, which had an oily gleam upon it indicative of herring, and sent out from the bows of the boat bright phosphorescent sparkles of light. The men several times thought they were right over the fish, but the skipper knew better. At last, after a lengthened cruise, our commander, who had been silent for half-an-hour, jumped up and called to action. "Up, men, and at 'em," was then the order of the night. The preparations for shooting the nets at once began by our lowering sail. Surrounding us on all sides was to be seen a moving world of boats; many with their sails down, their nets floating in the water, and their crews at rest, indulging in fitful snatches of sleep. Other boats again were still flitting uneasily about; their skippers like our own, anxious to shoot in the best place, but as yet uncertain where to cast: they wait till they see indications of fish in other nets. By and by we are ourselves ready, the sinker goes splash into the water, the "dog" (a large bladder, or inflated skin of some kind, to mark the far end of the train) is heaved overboard, and the nets breadth after breadth, follow as fast as the men can pay them out (each division being marked by a large painted bladder), till the immense train sinks into the water forming a perforated wall a mile long and many feet in depth; the "dog" and the marking bladders floating and dipping in a long zigzag line, reminding one of the imaginary coils of the great sea-serpent.

Wrapped in the folds of a sail and rocked by the heaving

waves we tried in vain to snatch a brief nap, though those who are accustomed to such beds can sleep well enough in a herring-boat. The skipper, too, slept with one eye open ; for the boat being his property, and the risk all his, he required to look about him, as the nets are apt to become entangled with those belonging to other fishermen, or to be torn away by surrounding boats. After three hours' quietude, beneath a beautiful sky, the stars—

“Those eternal orbs that beautify the night”—

began to pale their fires, and the grey dawn appearing indicated that it was time to take stock. On reckoning up we found that we had floated gently with the tide till we were a long distance away from the harbour. The skipper had a presentiment that there were fish in his nets ; indeed the bobbing down of a few of the bladders had made it almost a certainty ; at any rate we resolved to examine the drift, and see if there were any fish. It was a moment of suspense, while, by means of the swing-rope, the boat was hauled up to the nets. “Hurrah!” at last exclaimed Murdoch of the Isle of Skye, “there’s a lot of fish, skipper, and no mistake.” Murdoch’s news was true ; our nets were silvery with herrings—so laden, in fact, that it took a long time to haul them in. It was a beautiful sight to see the shimmering fish as they came up like a sheet of silver from the water, each uttering a weak death-chirp as it was flung to the bottom of the boat. Formerly the fish were left in the meshes of the nets till the boat arrived in the harbour ; but now, as the net is hauled on board, they are at once shaken out. As our silvery treasure showers into the boat we roughly guess our capture at fifty crans—a capital night’s work.

The herrings being all on board, our duty is now to “up sail” and get home : the herrings cannot be too soon among the salt. As we make for the harbour, we discern at once how rightly the term lottery has been applied to the herring-fishery. Boats which fished quite near our own were empty ; while others again greatly exceeded our catch. “It is entirely chance work,” said our skipper ; “and although there may sometimes be millions of fish in the bay, the whole fleet may not divide a hundred crans between them.” On some occasions, however, the shoal is hit so exactly that the fleet may bring into the harbour a quantity of fish that in the gross would be an ample fortune. So heavy are the “takes” occasionally, that we have known the nets of many

boats to be torn away and lost through the sheer weight of the fish which were enmeshed in them.

The favouring breeze soon carried us to the quay, where the boats were already arriving in hundreds, and where we were warmly welcomed by the wife of our skipper, who bestowed on us, as the lucky cause of the miraculous draught, a very pleasant smile. When we arrived the cure was going on with startling rapidity. The night had been a golden one for the fishers—calm and beautiful, the water being merely rippled by the land-breeze. But it is not always so in the Bay of Wick; the herring-fleet has been more than once overtaken by a fierce storm, when valuable lives have been lost, and thousands of pounds' worth of netting and boats destroyed. On such occasions the gladdening sights of the herring-fishery are changed to wailing and sorrow. It is no wonder that the heavens are eagerly scanned as the boats marshal their way out of the harbour, and the speck on the distant horizon keenly watched as it grows into a mass of gloomy clouds. As the song says, "Caller herrin'" represent the lives of men; and many a despairing wife and mother can tell a sad tale of the havoc created by the summer gales on our exposed northern coast.

From the heights of Pulteneytown, overlooking the quays and curers' stations, one has before him, as it were, an extended plain, covered with thousands and tens of thousands of barrels, interspersed at short distances with the busy scene of delivery, of packing, and of salting, and all the bustle and detail attendant on the cure. It is a scene difficult to describe, and has ever struck those witnessing it for the first time with wonder and surprise.

Having visited Wick in the very heat of the season, and for the express purpose of gaining correct information about this important branch of our national industry, I am enabled to offer a slight description of the place and its appurtenances. Travellers by the steamboat usually arrive at the very time the "herring-drave" is making for the harbour; and a beautiful sight it is to see the magnificent fleet of boats belonging to the district, radiant in the light of the rising sun, all steadily steering to the one point ready to add a large quota to the wealth of industrial Scotland. As we wend our way from the little jagged rock at which we are landed by the small boat attendant on the steamer, we obtain a glimpse of the one distinguishing feature of the town—the herring commerce. On all sides we are surrounded by herring. On

our left hand countless basketfuls are being poured into the immense gutting-troughs, and on the right hand there are countless basketfuls being carried from the three or four hundred boats which are ranged on that particular side of the harbour; and behind the troughs more basketfuls are being carried to the packers. The very infants are seen studying the "gentle art;" and a little mob of breechless boys are busy hooking up the silly "poddies." All around the atmosphere is humid; the sailors are dripping, the herring-gutters and packers are dripping, and every thing and person appears wet and comfortless; and as you pace along you are nearly ankle-deep in brine. Meantime the herrings are being shovelled about in the large shallow troughs with immense wooden spades, and with very little ceremony. Brawny men pour them from baskets on their shoulders into the aforesaid troughs, and other brawny men dash them about with more wooden spades and then sprinkle salt over each new parcel as it is poured in, till there is a sufficient quantity to warrant the commencement of the important operation of gutting and packing. Men are rushing wildly about with note-books, making mysterious-looking entries. Carts are being filled with dripping nets ready to hurry them off to the fields to dry. The screeching of saws among billet wood, and the plashing of the neighbouring water-wheel, add to the great babel of sound that deafens you on every side. Flying about, blood-bespattered and hideously picturesque, we observe the gutters; and on all hands we may note thousands of herring-barrels, and piles of billet-wood ready to convert into staves. At first sight every person looks mad—some appear so from their costume, others from their manner—and the confusion seems inextricable; but there is method in their madness, and even out of the chaos of Wick harbour comes regularity, as I have endeavoured to show.

So soon as a sufficient quantity of fish has been brought from the boats and emptied into the gutting-troughs, another of the great scenes commences—viz., the process of evisceration. This is performed by females, hundreds of whom annually find well-paid occupation at the gutting-troughs. It is a bloody business; and the gaily-dressed and dashing females whom we had observed lounging about the curing-yards, waiting for the arrival of the fish, are soon most wonderfully transmogrified. They of course put on a suit of apparel adapted to the business they have in hand—generally of oil-skin, and often much worn. Behold

them, then, about ten or eleven o'clock in the forenoon, when the gutting scene is at its height, and after they have been at work for an hour or so : their hands, their necks, their busts, their

“ Dreadful faces throng'd, and fiery arms ”—

their every bit about them, fore and aft, are spotted and besprinkled o'er with little scarlet clots of gills and guts ; or, as Southey says of Don Roderick, after the last and fatal fight—

“ Their flanks incarnadined,
Their poitral smear'd with blood ”—

See yonder trough, surrounded by a score of fierce eviscators, two of them wearing the badge of widowhood ! How deftly they ply the knife ! It is ever a bob down to seize a herring, and a bob up to throw it into the basket, and the operation is over. It is performed with lightning-like rapidity by a mere turn of the hand, and thirty or forty fish are operated upon before you have time to note sixty ticks of your watch. These ruthless widows seize upon the dead herrings with such a fierceness as almost to denote revenge for their husbands' deaths ; for they, alas ! fell victims to the herring lottery, and the widows scatter about the gills and guts as if they had no bowels of compassion.

NATURAL AND ECONOMIC HISTORY OF THE HERRING.

PART III.

Number of Individual Herrings Captured—Probable Value of the Total Catch—Whitebait Consumption—Value of the Sprat Harvest—The Exportation of Pilchards—Extent of Netting employed in the Herring Fishery—The Brand—Statistics—Organization of the Fishery.

SOME idea of the magnitude and value of the annual herring harvest of the British dominions may be conveyed to the minds of those who are unfamiliar with the practical details of the fishery when it is stated that in the year 1880 as many as 1,473,600 barrels of herrings were cured in Scotland. As each barrel of herrings contains on the average 800 fish, the total number of herrings cured in Scotland in 1880 may be set down as being, in all probability, 1,178,780,000.

The Scottish fishery board, however, only preserves a record of the herrings which are cured (salted), and more particularly of those barrels which are "branded" by its officers; but, in addition to the quantities of herring cured and branded, a very large number are sent to market just as they are caught, these being known as "fresh" herrings. No official account being taken of those fish, it is not possible to do more than guess the quantity so disposed of. That it is very considerable we know, because the sale of fresh herrings in large towns and populous cities has become an important branch of fish commerce; it will not perhaps be an exaggeration if the number of herrings caught in Scotland for immediate despatch by railway to inland consumers be set down at 500,000 barrels, or about 400,000,000 individual fish.

No statistics of the quantities of herring caught in England are taken, and thus, although there are important fisheries on the Northumberland and Norfolk coasts, as well as on the shores of the Isle of Man, we can unfortunately do no more than guess the herring wealth of the English seas. It is in evidence that as

many as 32,000 *lasts* of these fish have been landed in the course of a season at Lowestoft and Yarmouth, and as a *last* numbers 13,200 individual fish, the total number of herrings so landed must have been 422,000,000 at least, and it may for the purposes of the present essay be assumed that quite as many are captured at other places in England. Of the number of herrings caught in Ireland we obtain some indication from the annual reports of the Irish fishery inspectors. In 1880 there were caught at certain specified places 96,000 *mease*; but that was an exceptionally small take, as two years previously more than double that quantity was caught. It may therefore, we think be assumed that on the average of years, 350,000 *mease* of herrings are taken in Irish waters, and as each *mease* represents 600 herrings, the total number captured will thus be 210,000,000 of individual fish. Adding the herrings taken in Great Britain and Ireland together, the following total will be obtained:—

| | |
|----------------|---------------|
| Scotland | 1,578,780,000 |
| England | 844,800,000 |
| Ireland | 210,000,000 |

Making the grand total of 2,633,580,000 herrings!

These, if counted as being of the value of one halfpenny each, would represent the handsome sum of five millions and about seventy thousand pounds sterling (5,069,958*l.* 6*s.* 8*d.*). But that sum does not, large as it is, represent the full value of the money derived from the herring family.

Only the common herring has been taken note of in the foregoing calculations; but a large sum of money is derived from the capture of the pilchard and also the sprat, whilst the tiniest of the family, named the whitebait, contributes to swell the value of the annual herring harvest.

Whitebait are caught in great abundance for consumption in the spring and summer-time, and daily served as one of the table luxuries of the great metropolis during the sitting of parliament. From February to August no *menu* is deemed complete unless it contains some preparation of whitebait.

Although the season for eating whitebait terminates with the prorogation of parliament, the consumption of these fish in London, and at such places as Blackwall and Greenwich, where fish dinners are a pronounced speciality of the London season, must amount to a wonderful figure, so far as numbers are concerned.

Whitebait as a fashionable *entree* are done with so soon as the "Ministerial fish dinner" has been swallowed, but in the 193 days which may be held as constituting the London season, counting from the first of February till "the twelfth" of August inclusive, there is a never-ceasing demand for these juvenile herrings. There is one popular restaurant in London which pays during the height of the season as much as 50s. a day for whitebait—the general fish account of that establishment is large—over £1200 per annum. There are, however, other establishments in London where a still larger quantity will perhaps be consumed, and as in the great metropolis and its suburbs, including Greenwich and Richmond, there are a thousand clubs, taverns, hotels, and restaurants, the frequenters of which demand a daily supply of that favourite fish, it would not perhaps be an over estimate to allow an average of four shillings per day to be expended by the proprietor of each house for whitebait, which gives a sum of £200 for the whole of these places of public hospitality. Multiplying the 193 days of the parliamentary season by £200, we arrive at a sum of £38,600, as the expenditure for whitebait in the clubs, hotels, restaurants, and taverns of London! That amount does not, of course, include whitebait consumed in private houses or at the numerous public dinners which are constantly taking place in the modern Babylon, and we must therefore allow a few hundred pounds as the annual cost of whitebait consumed in other places.

In the country whitebait is now presented at all dinners of importance, being brought from Billingsgate at express speed by provincial fishmongers—the young of "the poor man's fish" being thus a welcome dish at the rich man's table. The price of whitebait, it may be stated, when ordered to be sent from London in the height of the season is at the rate of three shillings per quart, in addition to which there is the carriage by mail train to pay. Two quarts will be required for a dinner to be served to twenty persons. Edinburgh and Glasgow also order their whitebait from London, notwithstanding that in the Friths of Forth and Clyde there are myriads of these fish which might be captured all the year round. As set forth above, the sum indicated as being expended in London for whitebait amounts to about £39,000 and in allowing a thousand pounds as being paid for the whitebait eaten over the rest of Great Britain, we not only round the figure, but keep well within the mark in putting down the cost of our annual supply of this dainty of the

tavern as being £40,000. How many individual fish that sum represents it is impossible to say, probably a billion or two ! It must be considered that in this calculation we are taking for the basis of our figures, not the prices earned by the fishermen, but the figures at which the fish are sold to the buyers. We may state on the authority of the late Frank Buckland that he saw on *one day* as many as twenty-eight baskets of these fish at the Fenchurch Street railway station, and he estimated the number of individual whitebait in these baskets as being about 700,000 ; he also mentions that £100 per week is paid in wages by one firm to their whitebait fishermen, and also that £40 per week is paid at Queenborough as wages to fishermen catching whitebait. These figures help to prove that our estimate of the consumption of this delicacy of the table is not exaggerated.

Another member of the *Clupea* family for which, in its season, there is a wonderfully large demand is the sprat. The sprat is a winter fish, and in London is popularly supposed to come in with the advent of the new Lord Mayor ; well-heaped dishes of the first sprats of the season being supposed, by those who never have the honour of a seat at his lordship's table, to form one of the courses of his inauguration banquet. In the winter months, when neither fruit nor flowers can be obtained for street sale, the sprat harvest comes as a godsend to the costermongers of London ; these persons being able to dispose of vast quantities in the meaner parts of the City with astonishing rapidity. The news of the sprat boats having arrived at the great piscatorial Bourse quickly becomes known to those versatile artists in the mysteries of hawking, and within an hour or two, the narrow streets in the neighbourhood of Billingsgate become blocked with the donkey carts and hand-barrows of hundreds of sprat vendors. In some seasons veritable myriads of these fish are captured on the English coasts, which are rapidly borne away by the railway trains to the innermost parts of the country : there are places, in consequence—far inland places—which now know the sprat which never knew it before. Previous to the days of railway transit—and even now—when a great glut was experienced, to find a market for them was impossible, and they were in consequence thrown upon the land in literal tons as manure ; the fish thus, in a sense, destroyed were more numerous than were the hairs on the heads of those who captured them. The occasions are now becoming rare when sprats cannot be utilized at first hand as food ; as an instance, however, of the difficulties which persons who consign

supplies of sprats to London have still to contend with, it may be recorded here that a dealer of Scarborough sent in one season 1,600 bushels of sprats which barely paid the cost of sending, and that he had brought some of them back at a further cost for carriage of a shilling per barrel, to put upon his land as manure, which is a pitiful circumstance. Some curers who send off sprats, according to Mr. Grant of the Board of Works, have often got a penny postage-stamp for a barrel of these fish, and lately, large quantities of sprats taken in the river Tay, were carted away to be thrown on the land.

It has been more than once shown by parties in a position to know, that the value of the sprats annually sold in London and other large English towns as well, from the beginning of November to the end of February, will in all probability amount to £25,000. In Scotland, the returns from sprat fishing to the men who capture them have been variously estimated by competent authorities at from £20,000 to £30,000 per annum; if, therefore, the figure of Scottish sprat value be placed at £25,000 per annum, it will be a fair splitting of the difference. The average wholesale price of these fish in the fishmarket of Glasgow, in which city there is during the season a heavy demand for the toothsome sprat, is about five shillings per barrel of probably 1500 fish. Calculating the average retail price of these at the rate of about fifteen for a penny, the national sprat harvest must yield a large sum. It will certainly be within the mark to say not less than £60,000 per annum, when the consumption of Liverpool, Manchester, Birmingham, and other large English towns is taken into account. It is not always easy to separate the wholesale from the retail value, but it may be stated, in the case of the sprat, that the price paid to the fishermen for those fish—at any rate on the Moray Firth—is about thirty-five shillings a ton, whilst the cost of the carriage to Billingsgate is at the rate of seventy-five shillings for that weight of sprats. We have thus a cost of £5 10s. at first hand, to which has to be added the commission of the salesman and the profit of the hawkers, before a price can be quoted to the public purchaser: in the end, the retail price of the sprat may reach the figure of £7 or more per ton. As to the supply to London alone, it is recorded that on one day as many as 26 tons of sprats have been sent from the far north of Scotland to the great metropolis, whilst in a period of six weeks as many as 300 tons passed over

the Great Northern and North-Eastern Railways, *en route* to the great centre of consumption.

In some seasons pilchards are uncommonly plentiful. They are caught chiefly off the coast of Cornwall, and it is on record that as many as 10,000 hogsheads of these fish, each containing 2,700, have been enclosed in the seines of St. Ives in one day. The pilchards are cured by being salted and are exported in great quantities to the Roman Catholic countries of the Continent. No reliable estimate can be given of the value of the pilchard harvest, no "official" statistics being collected of the numbers which are caught. The following summary of one year's export may be taken as being tolerably correct. It is for 1879, in which year the shipments from Penzance and Falmouth were as follows:—To Genoa, 7,855½ hogsheads; Leghorn, 1,157½ hogsheads; Naples, 2,698½ hogsheads; Venice, 226½ hogsheads.

These figures must of course be accepted with the proverbial grain of salt, and it is much to be regretted that an accurate account is not taken by proper officials of the vast contribution which the sea offers every year to the national commissariat. That the value of our herring fisheries has not been exaggerated may be proved from the fact that the Norwegian herring fishery yields 800,000 barrels, the fish of Norway being much easier to capture than the herrings which are taken off the coast of Scotland. In Scotland the fishermen have to go in search of the fish, but in Norway the herrings come up the numerous fiords with which the whole coast is indented in search of the fishermen. A coarse hempen seine net is then run across the mouth of the fiord, and the shoal, or some portion of it, is secured. But the fish, although they can no longer escape, are not taken. Norwegian herrings are usually found to have been feeding on some small forms of animal life, which fill their stomachs with black or red food. Till they have got rid of their food they will not take the salt; and the Norwegian fishermen consequently leave the fish for some days enclosed in the seine, to enable them to absorb their food. Pilchards, as has already been described (p. 55), are captured on the coast of Cornwall in a similar but more artistic fashion.

The established net for the capture of the herring, as has been stated, is known in Scotland as the "drift" net, from the circumstance of its drifting with the tide, and till seining was introduced in Lochfyne forty years ago, was the only kind of net in use for the catching of the herring. Formerly the nets used were made

from hemp, and were thick in the thread and of considerable bulk; now they are woven of fine cotton, so that they take up less room in the boats and appear more filmy in the water. Twenty years ago, we have been officially told, a herring-boat carried 24 nets, made of hemp, each net being 40 yards long, with 28 meshes to the yard, 144 meshes deep, and weighing 25 lbs. At the present time each boat carries from 50 to 60 nets, made of cotton, each net 60 yards long, with 35 meshes to the yard, 18 score meshes deep, and weighing not more than 14 lbs. In other words, a boat which used to carry a suite of nets extending to 960 yards carries 3,300 yards. Each boat may be said to have increased its catching power fivefold, because while the nets used to be about 6 or 7 yards, they are now over 10 yards deep; the suite made use of used to present a catching surface of 6,000 square yards, but now the catching surface is 33,000 square yards. The 6,000 square yards of netting made of hemp used to weigh about 600 lbs., the 33,000 square yards now weigh very little more than the same weight. As there are over 7,000 boats engaged in the Scottish herring fishery, it will at once be apparent that, with such formidable machinery of capture at the command of those who own them, the take of fish which has been indicated might, if the herrings are as plentiful as they are supposed to be, be largely added to. We note this because it has been said, indeed it has been proved, that boats long ago used to take as many herrings with their 960 yards of netting (24 nets) as they do now when they carry three or four times that number of nets.

The herring fishery in Scotland (undoubtedly the greatest fishery of the kind) is carried on from the shore. Of late superior vessels have been introduced to the herring fishery, costing a comparatively large sum of money, and steamboats have even been tried with considerable success. It is not always easy for the owner of the boat to know where he will fall in with the shoal of herrings; he knows generally that the fish are somewhere in a given locality, but whether they are 7 or 70 miles from the fishery port at which his boat finds a harbour he is unable to tell; there are certain localities where "the fish" may be expected to be, but even if the locality be accurately "spotted," no herrings may be caught, the nets may not hit the strata of fish, and so the take will be a barren one. There are always some men who can find the shoal, and so obtain a great haul of herrings; but it is, and has always been, a remarkable fact, that of two or three boats

fishing in the closest proximity to each other, the nets of only one of these may be well filled with herrings, the others may not contain a score. It is the rule for the boats to leave the harbour at a pretty early hour in the afternoon, as the skipper never knows how far he has to sail before he falls in with his prey. The nets, which have been laid out in an adjacent field to dry, are brought on board, and probably as early as four o'clock in the afternoon, the vessel is under way. At some ports in Scotland, as for instance, Fraserburgh or Wick, as many as from 600 to 700 or 800 boats may be seen leaving harbour for the night's work. Night is the time selected for the capture of the fish, as in the darkness the herrings are less likely to perceive the great wall of netting which has been placed in the water for their capture.

In Scotland about two-thirds of all the herrings caught are *cured* by being salted, and in England a large number of the same fish are also cured, either as bloaters or "reds." In Scotland the cure begins the moment the boat is able to discharge its cargo after reaching the harbour. The herrings are measured to the curer by the "cran," which contains 45 gallons of ungutted fish; they are after being gutted, packed in barrels which contain 37 gallons or about 800 herrings. On receipt, the herrings are tumbled out of the cran baskets into a large vat, and are plentifully sprinkled with salt, the foreman cooper or clerk keeping a correct note of the number of crans received from each boat. The women who perform the disagreeable task of gutting the fish carry on their business with great dexterity as well as rapidity. A gang of five women will gut, rouse in salt, and pack a barrel of herrings in less than ten minutes. The cure of such herrings as are intended to be submitted to the officers of the fishery board, in order to be branded, must be carried on with great precision after a prescribed formula. It is for instance an imperative rule, that all herrings to be branded, must be cured on the day they are caught, so that at ports where a fleet of from 500 to 1,000 boats have assembled for the season, a busy scene is presented on a day on which two-thirds of the vessels have come home with a take of from 20 to 80 crans each. Enterprising curers who may have 200 or 300 boats fishing for them, must of necessity retain during the season a large staff of coopers and gutters, the latter being usually all females, who are paid by the amount of work they perform. A fee of fourpence per barrel has now to be paid for all herrings which are branded.

The "brand" has been a fertile theme of controversy, some economists maintaining that Government officials should not be called upon to certify the quality of herrings any more than the quality of cheese or bread or beer. The working of the *cure* and the utility of the brand have been more than once inquired into by Parliament, with the result that it is still maintained; each barrel branded is now, however, charged for at the rate of fourpence. That the brand is largely taken advantage of the following figures will show: from 1870 to 1879, a ten year's average, of 850,875, barrels annually cured, and 583,542, barrels exported, 399,517 barrels were branded, the fees received on the average of each of these years being £6,658 9s. 8d. In 1880 the fees received for branding amounted to £11,488 2s., but, in that year, as has been stated, the total number of barrels cured was 1,473,600, of which number 1,009,811 barrels were exported, whereof there were branded 689,286 barrels. From 1861 to 1882 inclusive, the quantities of herrings cured was as follows:—

| | | | |
|-----------------------------|------------------|----------|------------------|
| 1861 ... | 668,828 barrels. | 1872 ... | 773,859 barrels. |
| 1862 ... | 830,904 " | 1873 ... | 939,233 " |
| 1863 ... | 654,816 " | 1874 ... | 1,000,561 " |
| 1864 ... | 643,650 " | 1875 ... | 942,980 " |
| 1865 ... | 621,763 " | 1876 ... | 598,197 " |
| 1866 ... | 658,146 " | 1877 ... | 847,718 " |
| 1867 ... | 825,589 " | 1878 ... | 905,768 " |
| 1868 ... | 651,433 " | 1879 ... | 841,796 " |
| 1879 ... | 675,143 " | 1880 ... | 1,473,600 " |
| 1870 ... | 833,160 " | 1881 ... | 1,111,155 " |
| 1871 ... | 825,475 " | 1882 ... | 1,282,973 " |
| 1883 ... 1,269,412 barrels. | | | |

As will be seen from these figures, the fishery fluctuates considerably; after the great takes of 1873-74-75, the fishery fell off in 1876 to 598,197 barrels. No reason can be assigned for the disparities of some years as compared with others, the number of boats engaged in the work does not vary to any great extent, and it may be said of the weather, which is an important factor in the account, that it "averages" pretty well over the season; the herring fleet, however, is not always successful in hitting the shoal which, although it numbers tens of millions of individual fish, is sometimes difficult to find. As giving some idea of the magnitude of a shoal of herrings, it may be mentioned that boats fishing at a distance of seven or eight miles from each other have each been known to obtain about 50 crans of fish, all evidently from the same shoal. As to the extent of a shoal

it may be stated on the authority of Captain M'Donald, of the "Vigilant" cruiser, that about the end of August 1877, he fell in with a shoal of herrings which extended to a distance of four miles, and was fully two miles in breadth. The shoal, according to Captain M'Donald, was one solid mass of herrings, which if laid out in single fish, would have covered a space of ground twice as extensive as that on which the City of London and its numerous suburbs, the whole county of Middlesex in fact, is now standing; the number of fish in this mass would in all probability be more than are captured in Scotland in two seasons!

The organization of the herring fishery in Scotland, which is now the seat of the "great fishery"—Holland being no longer mistress of the seas in this branch of work—is somewhat peculiar especially on the north-east coast. I shall briefly summarize here what has been already said: The curers are generally the mainspring of the industry, and engagements with the owners or captains of boats are made at the termination of one season for the fishery work of the following year. A curer will bargain to take all the fish which a certain number of boats will capture to the extent of 200 crans at a given figure, let us say, a pound the cran; but, in addition to giving that sum for each cran of fish, he will also give what is called locally "bounty money," to the extent of from £5 to £15 or £20, which is at once paid down on making the bargain; he will also provide drying ground for the nets, and probably dye-stuffs for them as well, likewise a few gallons of whisky, but there are now many boats that do not carry any drink, the captains of which take all that is to be obtained in the shape of ready money only. Now-a-days, when the railways are extended to nearly every fishing port, and large numbers of herrings are despatched inland at once, many of the skippers refuse to contract, preferring to sell their fish direct from their boats to the buyers in waiting, taking such price as may be current, if herrings prove scarce obtaining a high figure, if they are plentiful, they have, of course, to be contented with a smaller sum. As will have been surmised by the reader, a curer who carries on an extensive business, and some of these men will have twenty or thirty curing stations in different herring ports, must have the command of a considerable amount of capital, as he requires to manufacture barrels for his fish, and to buy large quantities of salt with which to cure them; he has also in the season to provide for the wages of an army of workers of all kinds. As regards the boats, some of them are joint-stock

concerns belonging to companies of relatives, some of whom will only fish in the herring season, and follow their trade of tailor, shoemaker, or carpenter, at other times of the year. The money made during the fishing is in a sense extra, and some boats will, in the course of the season in fortunate years, take from 150 to 350 crans; having finished a contract with one curer, they are then ready to work for another, or to sell their fish to any customer they can find, at a price agreed upon. As these sheets are passing through the press [September, 1884] I note that some of the herring fishers of Fife have returned from the north, one boat having earned as much as £700, whilst some others have obtained £500 and £600 for their catch, and very few of the Fife boats have failed to secure their 200 crans.

THE HERRING IN HOLLAND—THE DUTCH FISHERIES.

Old Pictures of Dutch Fishing Industries—The Industry of the Dutch on the Scottish Seas—The Good conferred on a Country by its Fisheries—Facts and Figures of the Dutch Fisheries—Schevening—Lampreys for Bait ! Fisheries of the Zuyder Zee—The Herring in Holland.

It would not be difficult to find materials with which to fill more than one volume descriptive of the fishing industry of the Dutch. The set of illustrative old pictures already alluded to, are only a sample of many others which from time to time were published on the subject. The figures pertaining to the capture of herrings in Scotland by the fishermen of Holland in the olden time are really quite remarkable, and might, had they been French, have been set down as in some degree a work of the imagination, but with the matter-of-fact Dutch folks, there is not room for doubt. One thing is quite certain and that is, that in the herring-fishing and curing we have learned much from the fisher folks of Holland.

I am tempted to quote from "John Knox"* the following passages which bear on the subject :—

"Antiently," says that author, "the coast of Norway and Sweden abounded so plentifully in herrings, that vessels resorted thither from all the northern parts of the European continent to the amount of some thousands. Leaving that Northern coast, the herrings fell down upon Holstein, and the German shore, and became a valuable prey to the Hanse towns, who thereby acquired a degree of opulence, power, and splendour till then unknown in the north. About the beginning of the sixteenth century, the herrings also forsook the coasts of Germany and Holstein as appears by the writings of Cambden, Raleigh, Monsen, as well as foreign historians ; and it was during the subsequent period, that the industrious Dutch directed their attention to the Scottish fisheries with such assiduity and perseverance that it is conjectured they have thereby realised three hundred million sterling while

* *A View of the British Empire, etc.*, London, 1785.

the infatuated natives were mere dabblers both in taking and curing."

The figures given above are undoubtedly exaggerated, and so have been many of the other monetary statements published concerning Dutch fishing energy on the Scottish seas.

The Dutch have the reputation of being the first who observed the several seasons of the passage of the herrings, and their first regular fishery is, by their own historians, fixed at 1163. They also claim the merit of being the first who discovered the secret of pickling and of drying herrings, which they ascribe to William Benkelen of Biervlet, near Sluys, who died in 1397, and whose memory was held in such veneration for the service he had rendered mankind, that the Emperor Charles V. and the queen of Hungary, made a journey on purpose to visit his tomb. Such is the respect paid to those who pickle and barrel with dexterity.

The merit claimed by the Dutch, of being the first in this line, is not however founded in truth, since it is evident that herrings were cured both in Britain and on the continent, long before Benkelen's time, though it is probable that he made some improvements thereon; which his countrymen have carried to the highest degree of perfection, as well as the preparing or qualifying their salt. By their ingenuity and perseverance, they have reduced the whole business of the fisheries into a regular system, which, it would be the interest of other states to follow. They have likewise been widely aided from time to time, by their respective provincial legislatures, not only in every privilege and support, but also a well-digested body of laws and regulations, extending to the most minute circumstance, from the commencement of the out-fit, to the export of the herrings; and to all persons of whatever profession or denomination, from the day-labourer to the merchant; enforced by oaths, and by penalties, adapted to the nature of every possible tresspass. No field is left for the voluntary exercise of honour and honesty. The upright man and the rogue are put on a level. "This is the law, and this is the penalty," is the language of a Dutch tribunal, to all persons without distinction, who engage in the fisheries. The reputation of their great staple, and the credit of the state are at stake, and he who is not naturally upright, is compelled to practical integrity.

Every person knows his duty, and the consequences of neglect, delay, or fraud; insomuch, that though the whole body of fishery laws may contain two or three hundred clauses, each individual

is so perfect in his own department, and so faithful to his trust, that misconduct seldom happens. The whole business is carried on as it were by mechanism, without noise, bustle, or jealousy ; for it may be observed, that almost every Dutchman is a patriot, having the interest of his country at heart, equally with that of his family.

Each of the four marine provinces hath a regular fishing board, established for facilitating whatever relates to that business, called a *Fishing Chamber*, to which there is a conservator and a certain number of assistants, clerks, etc. All the laws and regulations committed to the management of these official departments lead to the perfection, delicacy, and flavour of the herrings, by which the republic may enjoy a preference at foreign markets.

As to the vessels in use a century ago by Dutch fishermen we have the following description :—The Dutch busses, of all nations, are the best constructed for the herring-fishery in the open sea, as they are long round vessels, with a waist about 30 inches high, which not only makes them warm and comfortable, but safe for the fishermen, while employed in gutting and curing the herrings. A proper vessel for the herring-fishing on the coast of Shetland, in summer, if new, should not cost, with her new casks and every other fishing implement, under £1000, of which the nets cost a very large share. The size of the Dutch vessels run from 50 to 70 tons. They have what is called a fleet of 50 nets to each buss. The nets, when strung or made fast to the rope to which they are fixed, measure about 50 fathoms long, and $7\frac{1}{2}$ deep. What they call the buss rope, which is the rope that the whole fleet of nets depend upon, and by which the vessel rides when the nets are out, is generally 120 fathoms long, and $7\frac{1}{2}$ inches thick ; and of which the Dutch, Danes, and Prussians always have two, in case of one failing. These ropes are seldom used above three, often not above two years, and are made of the best materials, and great need is for it, as on it depends, in a storm, the safety of the out-fit of nets, buoys, ropes, etc. and perhaps a large haul of herrings. Instances have happened, when, by the failure of this rope, the whole out-fit has been lost, and the vessels obliged to return home.

Altho' it is said, and generally believed, that the herrings in summer are caught near the Shetland coast, yet it as frequently happens that they are caught near the Buchanness, but it as often happens that when they are caught near the Buchanness, and near Shetland, at the same time, that the latter are of a superior quality, and give a higher price at market,

The fishing vessels are all divided below decks in rooms calculated to hold each its particular part of the out-fit, and the access to each of them is from the deck by a separate hatch. When they set out, the vessels are quite full of casks, one part of which is filled with salt sufficient to fill the whole cargo. This is always foreign salt, either bay salt or St. Ubes. No British salt has strength to cure the fat herrings caught here in summer.

It is interesting to see the Holland of to-day, and to compare its fishing fleets with those of other nations. During a lengthened tour I was fascinated by all I saw. Flat fish are the *spécialité* of the Dutch sea fisheries, eels ranking next, vast numbers being taken in the canals of South Holland, and large quantities are also obtained from the numerous lakes of Friesland. An active fishery of a miscellaneous description is likewise carried on in the Zuyder Zee. The fishermen who frequent that water capture in particular a small herring, locally known as pan-fish, and they likewise obtain great supplies of anchovies, or rather sprats, as well ; but in South Holland the fish chiefly taken are soles and flounders.

At Scheveningen there are about one hundred and forty boats engaged in this kind of fishery, and also in the red-herring fishery—that is, in capturing herrings which are ultimately smoked. It is interesting to observe the fishing fleet come into Scheveningen : there being no harbours at that place, the vessels have to sail right upon the sandy beach. The luggers are admirably constructed for that purpose, being flat bottomed as well as blunt bowed, and having, instead of a keel, a large wooden wing at each side, for the purpose of keeping the ship steady. So built, these boats can run quite safely against the shore, although it surprises one not acquainted with their particular build to see them float right on to the beach with all their sails set. As soon as the vessels take the ground, the crew commence to wade ashore with the produce of the fishery—generally flounders, plaice, and soles, packed in wicker baskets of tolerable size. The women, as is the case in most fishing places, are at hand to receive and carry away the produce ; and when any very small fish are taken, they fall to these female carriers as a perquisite. The vessels are each fitted with a couple of light trawl nets, which are hauled to the mast-head to be dried, on the ship arriving at the beach. The Dutch fish on the numerous banks of the German Ocean, only, however, for flat fishes ; they have

done very little of late in the way of local line-fishing, partly, no doubt, from the custom which has so long prevailed of following after one kind of fish. The Dutch have, however, a winter cod-fishery, to which their busses proceed after knocking off from what is called in Holland the great fishery. There are no shell-fish about this part of the Netherlands, but large quantities are obtained in other places. At the western side of the Texel, I was told there are both oyster and mussel fisheries, and at Bruinisse, in Zealand, there are fifty or sixty boats employed in obtaining these molluscs. I could not learn that any lobsters or crabs were taken at those places I visited; but, as there are no rocks among which they can find a fit dwelling-place, crustaceans cannot be expected. Mr. Maas of Scheveningen intends to introduce a shore line-fishery. I asked him where he could get bait. "Oh," he replied, "I can get thousands of splendid lampreys." Only think of such fine fish being cut up for bait! Would it not pay better to send them to London?

The herring fishery on the Zuyder Zee has no connection whatever with the "great fishery;" it is a miscellaneous fishery for winter herrings and sprats, which are cured in different ways, also for the universal flounder and the abounding eel; whilst the great fishery is for the herring only. Many of the fishermen stay out at sea in their beautifully clean half-decked boats during the week, and only come home to their families on Saturday night, their cargo being taken from time to time, as it accumulates, to the curer. The quaint races of fishermen who dwell on the curious islands of Marken, Urk, and Shokland, leave their homes at midnight on Sunday, and, if they find fish, do not return till the following Saturday. There are about twelve hundred boats of all kinds fishing on the Zuyder Zee, and numerous smokeries have been erected for smoking the herrings. The people are now becoming very proficient in this branch of the fishery business, which was inaugurated by the fishermen of Dieppe during the twelfth century. The Dutch do not esteem the *fresh* herring so highly as we do in Britain—indeed the Zuyder Zee herrings are in a measure despised—still the fresh herring fishery is of considerable value, and yields about £40,000 a year to Scheveningen, Catwyk, and Noordwyk, not to speak of what it brings in to Monnikendam, Enkhuizen, Wollenhove, and numerous other little fishing towns or hamlets. I found it exceedingly difficult to procure reliable statistics of the produce of the fisheries carried on in the Zuyder Zee, but was told that

the eels which are annually caught may be valued at 85,000 florins, and that the sprat fishery will produce four times that amount of money. As to the fresh herring fishery, the figures, although they were double the amount stated above, would, after all, be modest compared to those of the Scottish herring fishery.

The Frieslanders are mighty fishers; two-thirds of their fishing craft are on the Zuyder Zee, and their part of the country, as may be seen from a map, is full of lakes, some of them of large size. The Frisons derive wealth from the waters as well as from their peat grounds, and many of their lakes and fish-ponds have been formed out of holes created by carrying away the peat. The Frison people also carry on fishing industries on the islands of Ter Schelling and Ameland, which lie opposite their coast, and which were once united as a part of the land. Then, again, there is a fishery at Hourn; and Hourn is celebrated: it gave to Holland the famous navigator who doubled the Cape which he called after his birth-place. There are about two hundred fishermen there, men quite as industrious as their opposite neighbours, the Frisons. There is no doubt that the Dutch are reviving their fisheries; but it is amusing to hear everywhere of the former greatness of this branch of industry, and to contrast it with what now prevails. It is instructive to note that some of the towns in Holland, which were at one time famous and wealthy fishing ports, are fast fading away into ruins. There is Enkhuizen, which, long ago, sent a fleet of one hundred and fifty mighty vessels to the "great fishery," escorted by a squadron of war-ships, now sending only seven vessels; but the greatness of the place has passed away, and that town at present is but a wreck or shadow of its former self. Most of the fish taken by the Dutch are sent out of Holland—the eels to Billingsgate, the flounders to Belgium, the turbot to London or Paris, and so forth. The fish-markets are but poorly supplied with what was once the staple article of the country—another illustration of that old proverb which tells us about the scarcity of coals at Newcastle-on-Tyne.

One would suppose the herring in Holland to be an altogether different animal from the fish which bears that name in Great Britain. The Dutch reverence the stork, but they almost worship the herring; it is without question their national fish, and they most lovingly eat it—raw out of the pickle! and some of the people are so fond of it that they devour it, bones, fins, and all. Amsterdam is reputed to have been founded on herring bones; and whatever greatness Holland has achieved in commerce has

undoubtedly grown from the apprenticeship served by its sons on the waters, in the days when the greatness of the nation arose from its fisheries. Although the herring fishery of the Netherlands has fallen off greatly from what it was, it is again reviving; and the shipowners of Holland talk confidently of renewing the ancient glory of their "herring drave," which at one time was the most gigantic fleet upon the seas. In the meantime, although the trade in herrings be comparatively small, the individual love of the fish is as great as ever. In all towns and cities of that remarkable country there are shops for the sale of this fish and in these shops there are always to be found numerous persons partaking of that most choice delicacy—a pickled herring. One requires to be among the Dutch when the arrival of the new fish takes place, to understand the universal love of the people for the herring. It is wonderful to note the enthusiasm which is developed the moment it becomes known that the new fish have come to hand. A fast vessel brings in the first fruits of the cure from the ocean fleet, and lo! the people burst into a demonstration. At one time they used to deck the steeple of Vlaardingen Church—Vlaardingen is now the chief herring port—and ring a joyful peal of bells. The curers and shipowners decked their houses with flowers; and persons who sold the fish decorated their signboard, in order to let the public know that the newly cured delicacy had arrived. Then rival curers sent off a sample of their herrings to the king; and many a rapid race has been run to the Hague, in order to have the honour of being first in the field, and so obtain the reward of five hundred guilders which were given on the occasion. There is not now, I believe, so much outward demonstration; but the first fruits of the fishery are as valuable as ever, a single herring often costing a couple of guilders! Herrings are usually served raw in Holland, with a sauce of vinegar, cucumber, etc.; they are also dressed with salad and are likewise eaten *au naturel*. No stranger should leave Holland without making trial of the national dish; it is as delicious in its way as the Scotch kipper herring, or as the exquisite broiled fresh herring of Lochfyne, and almost beats the famous "splitbellies" of the Moray Firth fishing towns.

It is curious that while the State has ceased to interfere in any way with the herring fishery, the size of the mesh, the mode of fishing, and all other details, being left to the honour of the boat owners, it still regulates with jealous care the cure of the fish. The curing laws are carried out as rigorously as ever: the captains

are sworn to do their duty in seeing that the herrings are properly cured. Scottish herrings—and it is in Scotland we now find the really “great” fishery for the poor man’s fish—are mostly cured on shore ; but a movement is now [1884] being made to cure on board as well. Dutch herrings, again, are cured on board the vessel that captures them ; and there is no question but that their cured herrings are superior to ours, although I think they would be still better if Government would let them alone, and let each curer stand or fall by the perfection of his individual cure. It is certain that a great deal of pains is taken with the manipulation of the herring on board the Netherland busses ; and at one time the Dutch mode of cure was kept a profound secret, it being a strict rule that no stranger should be admitted on board the fishery vessels.

The superiority of the Dutch cure is said to be owing to the use of a superior kind of salt, which the boat-owners take great pains to procure, and to purify still further after they obtain it, and also to the very careful selection and assorting of the fish into different classes, as “full” herrings, “Matjes,” etc. Only a portion of the intestines is taken out of the herring by the Dutch ; they content themselves by removing the gills and stomach, leaving the crown-gut in the fish. The herrings, as fast as they are prepared, are thrown into a strong brine, in which they are kept for eighteen hours before being packed in the barrels. It is an imperative rule of the great fishery that all herrings taken on one day must be cured during that day ; herrings that cannot be cured on the day they are caught must be thrown overboard, or as an alternative they may be so packed as to be sold for inferior fish. There is a penalty of 300 guilders exigible from the master of the buss in case he should fail to perform his duty according to rules which is laid down for his guidance. As I have said great pains are taken to procure the salt. All the fish caught before St. James’ day are cured with Spanish or Portuguese salt ; those fish are known as herrings of the *large* salt ; the herring cured after that date are known as herrings of the *fine* salt, only the finest Dutch-made small salt being used. Then it is a rule of the great fishery that barrels made of new and good oak only must be used. A small steamer in attendance on the fleet starts off to Vlaardingen as soon as it can collect a hundred barrels of fish, the “hunters” or “yagers” in attendance on the fishery vessels follow as rapidly as they can, the first one after the steamer with 120 barrels, the second one with fifty more, etc. , and the first fish bring the great prices already alluded to.

In consequence of the crew having both to fish and to cure, the mass of the herrings taken cannot be dealt with so as to receive the Government brand ; they lie in salt, therefore, in the vessel, and after arriving at home, are taken out and smoked, but of course only realise an inferior price.

OUR PRINCIPAL TABLE FISHES.

The two greatest fish families—The Gadidæ—The Haddock—"Finnan Haddies"—The Common Cod—Cod Liver Oil—Curing Cod fish—The Whiting—Hake, Ling, and Tusk—Halibut—The Turbot—Soles—The Brill—The Dab—The Plaice—Conger, Skate, and Smelt—The Cock-Paitle.

THE two families that supply the cod, haddock, turbot, sole, and other well-known table-fishes, such as the whiting and flounder, are known to naturalists as *Gadidæ* and *Pleuronectidæ*—the latter being the family of the flat fishes.

Cod and turbot are of considerable individual value, large prices being, at certain seasons of the year, obtained for them ; indeed, it is not long since that the columns of the *Times* recorded that a guinea had been given for a single cod-fish ; and as to haddocks and whittings, once so cheap, they are now, in every sense of the word, dear, because, in addition to costing much money, they are not so fine in quality as they used to be. At one time, in various parts of both England and Scotland, a prime haddock, of say three pounds weight, might have been purchased for about twopence ; and a cod-fish of great size could, in the days referred to, be purchased for less than one shilling. Thirty years ago all kinds of white fish could be bought at less than a penny per pound weight ; and as for sprats and herrings a large dish of the former could be had for a half-penny, whilst "three a penny" was a common price for the finest fresh herrings. At various times within the memory of the present generation, both sprats and herrings have been so plentiful as to be sold for manure. The railways, which have altered so many conditions of life and trade, have greatly changed the whole system of fish commerce. Thousands of tons of our best food fishes are now borne daily from the sea to the great inland seats of population, where there is a sure and speedy demand for as much as can be sent. The London commissariat alone, supplemented by a few other large cities, demands, but fortunately, does not obtain, all the fish of the sea ! Haddocks, cod-fish, whittings, and turbot, can be sold in any quantity when the price is moderate ; but no

person can exactly estimate the supply, as there is no record kept at Billingsgate of the total business done there ; nor is all the fish business of London now transacted at Billingsgate, as many fishmongers obtain their supplies direct from the coast. We should be glad if reliable statistics of the annual "take" of sea-fish were collected by Government. Correct figures would be a guide as to the supplies ; we should then really know if our fish food was increasing or diminishing. What is done for the herring in Scotland might be done for other fishes.

The natural history of our white fish is but imperfectly known. As an instance of the very limited knowledge we possess of the natural history of even our most favourite fishes, I may state that at a meeting of the British Association a few years ago, a member who read an interesting paper *On the Sea Fisheries of Ireland*, introduced specimens of a substance which the Irish fishermen considered to be the spawn of the turbot ; stating that wherever this substance was found trawling was forbidden ; the supposed spawn being in reality a kind of sponge, with no other relation to fish except as being indicative of beds of mollusca, the abundance of which marks that fish are plentiful. It follows that the stoppage of trawling on the grounds where this kind of squid is found is the result of sheer ignorance, and causes the loss, in all likelihood, of great quantities of the best white fish. It is not easy to say when the Gadidæ are in proper season. Some members of that family are used for table purposes all the year round ; and as different salmon rivers have their different close-times, so undoubtedly the white fish of different seas or firths have different spawning seasons. In reference, for instance, to so important a fish as the turbot, we are very vaguely told by Yarrell that it spawns in the spring-time, but no indication is given of the particular month in which that important operation takes place, or how long the young fish take to grow. Even a naturalist so well informed as Mr. James Wilson was of opinion that the turbot was a fish which migrated from place to place.

The combined ignorance of naturalists and fishermen has much to do with the scarcity of white fish now beginning to be experienced ; and unless some plan be hit upon to prevent over-fishing, we may some fine morning experience the same astonishment as a country gentleman's cook, who had given directions to the gamekeeper to supply the kitchen regularly with a certain quantity of grouse. For a number of years she found no lack,

but in the end the purveyor threw down the prescribed number, and told her she need look for no more from him, for on that day the last grouse had been shot. "There they are," said the gamekeeper, "and it has taken six of us, with a gun apiece, to get them, and after all we have only achieved the labour which was gone through by one man some years ago." The cook had unfortunately never considered the relation between guns and grouse.

The Gadidæ family is numerous, and its members are valuable for table purposes; three of the fishes of that genus are particularly in request, viz., whiting, cod, and haddock. These are the three most frequently eaten in a fresh state; there are others of the family which are extensively captured for the purpose of being dried and salted, among which are the ling, tusk, etc. The haddock (*Morrhua aylefinus*) has ever been a favourite fish, and the quantities of it which are annually consumed are really wonderful. Vast numbers used to be taken in the Firth of Forth, but from recent inquiries I am led to believe that the supply has considerably decreased of late years, and that the local fishermen have to proceed now to considerable distances in order to procure any quantity.

This prime fish, the haddock, has more than once become scarce. I have been reminded of a time, in 1790, when three of these fish were sold for 7s. 6d. in the Edinburgh market; but although there have been from time to time sudden disappearances of the haddock from particular fishing-grounds, as indeed there have been of all fish, I once took part in a newspaper controversy about the scarcity of the haddock, and I found plenty of opponents ready to maintain that there was no scarcity, but that any quantity could be captured. In some degree that is the truth, but what is the hook-power required now to capture "any quantity," and how long does it take to obtain a given number as compared with former times, when that fish was supposed to be more plentiful? Why do we require, for instance, to send to Norway and other distant places for haddocks and other white fish? The only answer I can imagine is that we cannot get enough at home. As to the general scarcity of white fish, the late Mr. Methuen, the fish-curer, wrote some few years ago:—"This morning I am told that an Edinburgh fishmonger has bought all the cod brought into Newhaven at 5s. to 7s. each. I recollect when I cured thousands of cod at 3d. and 4d. each; they were caught between Burntisland and Kincardine, on which

ground not a cod is now to be got ; and at the great cod emporium of Cellardyke, the cod fishing instead of threescore for a boat's fishing, has dwindled down to about half a dozen cod."

The old belief in the migratory habits of fish comes again into notice in connection with the haddock. Pennant having taught us that the haddock appeared periodically in great quantities about mid-winter, that theory is still believed, although the appearance of this fish in shoals may be easily explained, from the local habits of most of the denizens of the great deep. It is said that "in stormy weather the haddock refuses every kind of bait, and seeks refuge among marine plants in the deepest parts of the ocean, where it remains until the violence of the elements is somewhat subsided." This fish does not grow to any great size ; it usually averages about four pounds. I prefer it as a table fish to the cod. The very best haddocks are taken on the coast of Ireland. The haddock spawns in February or March, and in six months time it is said the young are several inches in length : it is often taken when it is of a small size, countless thousands coming to market that do not weigh over half a pound each. Haddocks are in prime condition for the table in the three winter months of the year, and I think at their best in the month of November—a two pound fish is well worth eating. When possible, the haddock should be boiled in sea water. The haddock is a gregarious fish.

The comparative scarcity of fresh haddocks, as compared with their reputed former abundance, may in some degree be accounted for by the immense quantities which are converted into "Finnan haddies"—a well-known breakfast luxury no longer confined to Scotland. It is difficult to procure genuine Finns, smoked in the original way by means of peat-reek ; like everything else for which there is a great demand, Finnan haddocks are now "manufactured" in quantity ; and, to make the trade a profitable one, they are cured by the thousand in smoking-houses built for the purpose, and are smoked by burning wood or sawdust, which, however, does not give them the proper *gout*. In fact the wood-smoked Finns, except that they are fish, have no more the right flavour than Scotch marmalade would have were it manufactured from turnips instead of bitter oranges. Fifty years ago it was different ; then the haddocks were smoked in small quantities in the fishing villages between Aberdeen and Stonehaven, and entirely over a peat fire. The peat-reek imparted to them that peculiar flavour which gained

them reputation. The fisher-wives along the north-east coast used to pack small quantities of these delicately-cured fish into a basket, and give them to the guard of the "Defiance" coach, which ran between Aberdeen and Edinburgh, and the guard brought them to town, confiding them for sale to a brother who dealt in provisions; and it is known that out of the various transactions which thus arose, individually small though they must have been, the two made, in the course of time, a handsome profit. The fame of the smoked fish rapidly spread, so that cargoes used to be brought by steamboat, and Fannans are now carried by railway to all parts of the country with great celerity, the demand being so great as to induce men to foist on the public any kind of cure they can manage to accomplish; indeed smoked codlings are extensively sold for Finnan haddocks. Genuine smoked haddocks of the Moray Firth or Aberdeen cure can seldom now be had, below sixpence per pound weight.

The common cod (*Morrrhua vulgaris*) is, as the name implies, one of our best-known fishes, and it was at one time very plentiful and cheap. It is found in the deep waters of all our northern seas, but has never been known in the Mediterranean. It used to be largely captured on the coasts of Scotland, and it occurs in profusion on the coasts of Newfoundland, where its plentifulness led to a great fishery being established. The cod is extremely voracious, and eats up most greedily the smaller inhabitants of the seas; it grows to a large size, and is very prolific in the perpetuation of its kind. A cod-roe has more than once been found to be half the gross weight of the fish, and specimens have been caught with upwards of three millions of eggs; but of course it cannot be expected that in the great waste of waters all the ova will be fertilised, or that any but a small percentage of the fish can ever arrive at maturity. This fish spawns in mid-winter, but there are no very reliable data to show when it becomes re-productive. My own opinion has already been expressed that the cod is an animal of slow growth, and I would venture to say that it is at least two years old before it is endowed with any breeding power. I may call attention here to one of the causes that must tend to render the fish scarce. As if the natural enemies of the young fish were not sufficient to aid in its extirpation, and the loss of the ova from causes over which man has no control, not enough in the way of destruction, there is a commerce in cod-roe, enormous quantities of it being used in France as ground-bait for the sardine fishery. The roe of this

fish is also frequently made use of at table ; a cod-roe of from two to four pounds in weight can unfortunately be bought for a mere trifle, but it ought to cost a good few pounds instead of a few pence. The quantity of eggs yielded by a female cod is often three millions : supposing only a third of these come to life—that is one million—and that a tenth part of that number, viz. one hundred thousand, becomes in some shape—that is, either as codling or cod—fit for table uses, what should be the value of the cod-roe that is carelessly consumed at table ? If each fish be taken as of the value of sixpence, the amount would be £2500. But supposing that only twenty full-grown codfish resulted from the three millions of eggs ; these, at two and sixpence each, would represent the sum of fifty shillings as the possible produce of a dish, which, in the shape of cod-roe, cost only about as many farthings ! Of course when cod-fish are caught, they must be utilised ; but it would be better if cod-fish caught as they are about to spawn, could be restored to the sea for a few weeks. This could easily be done, most of the fish being alive when they are taken off the hooks.

Cuvier tells us that “almost all the parts of the cod are adapted for the nourishment of man and animals, or for some other purposes of domestic economy. The tongue, for instance, whether fresh or salted, is a great delicacy ; the gills are carefully preserved, to be employed as baits in fishing ; the liver, which is large and good for eating, also furnishes an enormous quantity of oil, which is an excellent substitute for that of the whale, and applicable to all the same purposes ; the swimming-bladder furnishes an isinglass not inferior to that yielded by the sturgeon ; the head, in the places where the cod is taken, supplies the fishermen and their families with food. The Norwegians give it with marine plants to their cows, for the purpose of producing a greater proportion of milk. The vertebræ, the ribs, and the bones in general, are given to their cattle by the Icelanders, and by the Kamtschatkians to their dogs. These same parts, properly dried, are also employed as fuel in the desolate steppes of the shores of the Icy Sea. Even their intestines and their eggs contribute to the luxury of the table.” Cod-liver oil is now well known in *materia medica* under the name of *oleum jecoris aselli*. The best is made without boiling, by applying to the livers a slight degree of heat, straining through thin flannel or similar texture. When carefully prepared it is quite pure, nearly inodorous, and of a crystalline transparency. The specific

gravity at temperature 64° is about 920° . It seems to have been first used medicinally by Dr. Percival in 1782 for the cure of chronic rheumatism ; afterwards by Dr. Bardsly in 1807. It has now become a popular remedy in all the slow-wasting diseases, particularly in scrofulous affections of the joints and bones, and in consumption of the lungs. The result of an extended trial of this medicine in the hospitals at London for the treatment of consumptive patients shows that about 70 per cent gain strength and weight, and improve in health, while taking the cod-liver oil ; and this good effect with a great many is permanent. The finest oil is obtained in Iceland and the Lofföden Islands, and it is in these localities we find the best fish ; the colder the sea, the better the cod. North Sea fishermen obtain it almost from the living animal, so that it is perfectly pure : these industrious fish catchers take the oil in large quantities to keep away colds and rheumatic attacks. The largest runs of oil are got from those fish in which the eggs are just beginning to form. It is a curious fact that cod-liver oil was used by curriers, even in preference to whale oil, it was also utilized as a lamp oil. Its medicinal qualities were discovered by accident. A "wasting child" began in time to gather flesh and to become ruddy with the hues of health. Its parents—the father was a leather dresser—watched the movements of the girl in order to discover the cause of the change in her health. Two or three times every day she was seen to dip her "piece" of bread in the oil can, and on being taxed with the practice, admitted that she liked the stuff. In a few months she became as healthy and strong as her brothers and sisters. Skate-liver oil, as also the oil of several other fishes, is likewise coming into use for medicinal purposes.

The codfish is best when eaten fresh, but vast quantities are sent to market in a dried or cured state : the great seat of the cod-fishery for curing purposes is at Newfoundland. But considerable numbers of cod and ling are likewise cured on the coasts of Scotland. The mode of cure is quite simple. The fish must be cured as soon as possible after it has been caught. A few having been brought on shore, they are at once split up from head to tail, and by copious washings thoroughly cleansed from all particles of blood. A piece of the backbone being cut away, they are then drained, and afterwards laid down in long vats, covered with salt, heavy weights being placed upon them to keep them thoroughly under the action of the pickle. By and by the fish are taken out of the vat, and are once more drained, being

at the same time carefully washed and brushed to prevent the collection of any kind of impurity. Next the fish are *pined* by exposure to the sun and air; in other words, they are bleached by being spread out individually on the sandy beach, or upon such rocks or stones as may be convenient. After this process has been gone through the fish are then collected into little heaps, which are technically called *steeples*. When the *bloom*, or whitish appearance which after a time they assume, comes out on the fish the process is finished, and they are then quite ready for market. The consumption of dried cod or ling is very large, and extends over the whole globe; vast quantities are prepared for the religious communities of Continental Europe, who make use of it on the fast-days instituted by the Roman Catholic Church.

Besides the common cod, there are the dorse (*M. callarias*), and the poor or power cod (*M. minuta*), also the bib or pout (*M. lusca*).

The whiting (*Merlangus vulgaris*) is another of our delicious table-fishes, which is found in comparative plenty on the British coasts. This fish is by some thought to be superior to all the other Gadidæ. Very little is known of its natural history. It deposits its spawn in March, and the eggs are not long in hatching—about forty days, I think, varying, however, with the temperature of the season. Before and after shedding its milt or roe the whiting is out of condition, and should not be taken for a couple of months. The whiting prefers a sandy bottom, and is usually found a few miles from the shore, its food being much the same as that of other fishes of the family to which it belongs. It is a smallish fish, usually about twelve inches long, and on the average two pounds in weight.

The hake (*Gadus merluccius*) may be mentioned in our list, it is not much known at table but cut in stripes dipped in butter and fried in oil, it is very palatable. The ling (*Gadus Molva*) is extensively sold in a cured state; it is the best of all the "hard fishes," in my opinion, it is handsome in shape, rather eel like, looks well in the water, and grows to a large size, specimens weighing between thirty and forty pounds are often captured. The tusk or torsk (*Brosmus Vulgaris*) is another of the same, one of the *Gadidæ*, it cures well, and swells out in the cooking; it is caught along with the ling.

I will now say a few words about the Pleuronectidæ.

There are upwards of a dozen kinds of flat fish which are popular for table purposes. One of these is a very large fish known

as the halibut (*Hippoglossus vulgaris*), which has been found in the northern seas to attain occasionally a weight of from three to four hundred pounds. One of this species of fish of extraordinary size was brought to the Edinburgh market in April 1828; it was seven feet and a half long, and upwards of three feet broad, and it weighed three hundred and twenty pounds! The flavour of the halibut is not very delicate, although it has been frequently mistaken for turbot by those not conversant with fish history. The best way to cook halibut is to stew it. It can be broiled in stripes and may be eaten with a little plain butter; the head and fins are excellent. The Jews, according to Mr. Buckland, are very fond of fried halibut. The fish is now somewhat scarce, it used to be taken in large quantities twenty five years ago.

The true turbot (*Rhombus maximus*) is the favourite perennial of aldermanic epicures, and fabulous sums are said to have been given at different times by rich persons in order to secure a turbot for their dinner table. This fine fish is, or rather used to be, largely taken on our own coasts: but now we have to rely upon more distant fishing grounds for a considerable portion of our supply. The late Mr. Wilson said, in writing about this fish:—"The English markets are largely supplied from the various sandbanks which lie between our eastern coasts and Holland. The Dutch turbot-fishery begins about the end of March, a few leagues to the south of Schevening. The fish *proceed* northwards as the season advances, and in April and May are found in great shoals upon the banks called the Broad Forties. Early in June they surround the island of Heligoland, where the fishery continues to the middle of August, and then terminates for the year. At the beginning of the season the trawl-net is chiefly used; but on the occurrence of warm weather the fish retire to deeper water, and to banks of rougher ground, where the long line is indispensable."

The turbot was well known in ancient gastronomy; the luxurious Italians used it extensively, and christened it the sea-pheasant from its fine flavour. In the gastronomic days of ancient Rome the wealthy patricians were very extravagant in the use of all kinds of fish; so much so that it was said by a satirist that

"Great turbots and the soup-dish led
To shame at last and want of bread."

The turbot is very common on the English and Scottish coasts,

and is known also on the shores of Greece and Italy. This fish is taken chiefly by means of the trawl-net, but in some places it is fished for by well baited-lines. We derive large quantities of our turbot from Holland, so much as £100,000 having been paid to the Dutch in one year for the quantities of these fish which were brought to London, and on which, at one time, a duty of £6 per boat was exigible. This fish spawns during the autumn, and is in fine condition for table use during the spring and early summer. Yarrell says the turbot spawns in the spring; but, with due respect, I think he is wrong; I would not, however, be positive about this, for there will no doubt be individuals of the turbot kind, as there are of all other kinds, that will spawn at different periods. The turbot is a great flat fish. In Scotland, from its shape, it is called "the bannock fluke." It is about twenty inches long, and broad in proportion; and a prime fish of this species will weigh from eight to twelve pounds, but specimens are common enough which weigh over twenty pounds. Vast numbers of young turbot are annually destroyed by trawlnets. Tens of thousands not bigger than a half-crown, I have been told, are sometimes taken shortly after the spawning season. Were these allowed to live the mature fish would then be more plentiful, and, as a matter of course, much cheaper than they are at present.

The best-known fish of the Pleuronectidæ is the sole (*Solea vulgaris*), which is largely distributed in all our seas, and used in immense quantities in London and elsewhere. The sole is too well known to require any description at my hands. It is caught by means of the trawl-net, and is in good season for a great number of months. Soles of a moderate weight are best for the table. I prefer such as weigh from three to four pounds per pair. I have been told, by those who ought to know best, that the deeper the water from which it is taken the better the sole. It is quite a ground fish, and inhabits the sandy places round the coast, feeding on minor crustaceans, and on the spawn and young of various kinds of fish. Good supplies of this popular fish used to be taken on the west coast of England, and they are said to be very plentiful in the Irish seas; indeed all kinds of fish are said to inhabit the waters that surround the Emerald Isle. There can be no doubt of this, at any rate, that the fishing on the Irish coasts has never been so vigorously prosecuted as on the coasts of Scotland and England, so that there has been a greater chance for the best kinds of white fish to thrive and

multiply. Seaside visitors would do well to go on board some of the trawlers and observe the mode of capture. There is no more interesting way of passing a seaside holiday than to watch or take a slight share in the industry of the neighbourhood where one may be located. A very curious fact about this fish may be here mentioned—almost nobody has ever seen a male fish, all the soles ever handled seem, if we can believe those who handle them, to be fish with roes only!

The smaller varieties of the flat fish—such as Muller's top-knot, the flounder, whiff, dab, plaice, etc.—I need not particularly notice, except to say that immense quantities of them are annually consumed in London and other cities. Mr. Mayhew, in some of his investigations, found out that upwards of 30,000,000 of plaice were annually required to aid the London commissariat! But that is nothing. Three times that quantity of soles are needed—one would fancy this to be a statistic of shoe-leather—the exact figure given by Mr. Mayhew is 97,520,000! This is not in the least exaggerated. I discussed these figures with a Billingsgate salesman, and he thinks them quite within the mark. The brill (*Pleuronectes Rhombus*) sometimes does duty—and with more success than the halibut—for the turbot. They are taken of considerable size, and make a good fish for the table—many a man has eaten the fins of the brill and thought himself an Alderman for the time being. The dab is one of the commonest of our flat fishes, and in the opinion of some persons, quite as toothsome as the flounder; but in my opinion the latter is the better fish of the two. The plaice, dab, and flounder, are known as “flukes.” The plaice may be called a poor man's fish. As has been shown, it is abundant in its season, and is both palatable and nutritious. It is largely sold in the fried fish shops of Houndsditch. It is cut in joints, dipped in butter, then fried in boiling oil.

The conger eel (*Conger vulgaris*) has of late come into notice, in consequence of its having been asserted that it is used very largely in the making of turtle soup. This was of course denied, but it is, I believe, a fact, that this fish has been often used as a basis for several kinds of soup, and why not? There is no better food material of the fish kind than conger, and on the continent these animals are much appreciated, and are prepared for the table in very different ways. Their power of reproduction has been already referred to on another page, and wonder has been expressed at their being so scarce. This fish

grows to a great size, individuals having been captured weighing over 70 pounds. In the fish market of Paris the conger finds a public eager to purchase, and in Spain and Portugal, dried conger is always eagerly bought. It is ground down into a kind of flour and used for the enrichment of various dishes.

The common skate is good for food, and although seldom presented at the table of the "well to do," is a favourite fish with poorer people. The skate, of which there are over a dozen varieties, is caught at certain seasons in great abundance, and is capable of being cooked in various modes; it attains large dimensions.

The smelt (*Osmerus Eperlanus*) is a member of the salmon family and is largely fed upon by *salmo salar* when he returns to the sea lean from the spawning ground. Smelts are always found in the estuary of a stream frequented by the salmon. Buckland says, "it is my opinion that the large size to which the salmon kelts of the Rhine and Tay attain is in a considerable measure due to the presence of smelts in the estuaries." It has been stated on the authority of a French Naturalist that its peculiar odour has been conferred on the smelt as a means of protection against its enemies, "all other fishes desert the place where the smelt comes to spawn, and leave the neighbourhood till the operation is finished."

The salmon, one of our most valued table fishes, will be dealt with at length in a future chapter, while incidental notices of other fish will be found on another page. There are so many varieties that it would require an additional volume to describe them all, the mullet family, might for instance, be descanted on, and the "Johnny Dorry" also; let me, however, remember one fish that would become a prime favourite at table if it were placed in the market, I allude to the lumpsucker, the "cock paidle" of Sir Walter Scott (see the *Antiquary*), which is very succulent and susceptible to the arts of the cook in a high degree. I need not say anything in this place with regard to the common fresh water fishes, these are really of no great commercial value. The eel is a remarkably good food fish, but those which I have noticed at some length represent our chief table fishes.

I have already alluded to the natural history of the mackerel, and have only to say of it in this place that it has now become a much appreciated summer fish even in Scotland—the people of which country used to entertain a prejudice against it. The *fama* against the mackerel which was so largely circulated in

1884 was effectually disproved ; this fish is quite as clean as its neighbours.

With regard to the question of a close time for herring and other sea fish, to which various references have been made in the preceding pages, I may reprint here what I said on the subject in a previous edition of this work :

I have always been of the opinion, notwithstanding the practical difficulties that would have to be encountered in carrying it out, that the want of a close-time, especially for the larger kinds of sea-fish, is one of the causes which are so obviously affecting the supplies. It is certain also, from chemical and sanitary investigation, that all fish are unwholesome at the period of spawning ; the salmon at that time of its life is looked upon as being little better than carrion. But, without dwelling on this phase of the question, or considering the effect of unwholesome fish on the public health, I must point out most strongly that the want of a well-defined close-time is one of the greatest and severest of our fish destroying agencies. We give our grouse a breathing space ; nay, we sometimes afford to that bird a whole jubilee year ; we do not shoot our hares during certain months of the year nor do we select their breeding season as the proper time to kill our oxen or our sheep ; but we do not at dinner-time object to an *entrée* composed of cod-roë, and we evidently rather believe in the propriety of killing only our seed laden herrings ! This lavish destruction of fish-life has arisen in great part from the well-known fecundity of all kinds of sea-fish, which has given rise to the idea that it is impossible to exhaust the shoals. But when it is considered that this wonderful fecundity is met by an unparalleled destruction of the seed and also of the young fish, we need not be astonished at the ever-recurring complaint of scarcity. An old and probably exaggerated complaint has been lately revived that the beam-trawl is one of the most destructive engines employed in the sea, five hundred tons of spawn being destroyed by trawlers in twenty-four hours ! That is undoubtedly an exaggerated statement, but there can be no doubt that there is annually an enormous waste of fish-life through the accidental destruction of very large quantities of spawn,—herring-spawn as well as all other kinds.

As has been hinted, the fixing of a close time for any of our sea-fish is surrounded by difficulties, but it would be quite easy

in many instances during the progress of the fishery to restore to the waters any fish of importance, such as the Cod or Turbot, which was obviously on the point of spawning. To use an Irishism, most of our larger sea-fish are caught alive,—in other words, they are living when removed from the hooks, or taken out of that piscine chamber of horror the Trawl net, and in consequence, could be easily restored to the waters from whence they had been taken, if found ready, to repeat the story of their birth. This plan, I am well aware, is somewhat objectionable, as it depends on the fishermen, who are not fond of rejecting a fish, no matter how bad may be its condition when taken.

It is difficult to say when the Gadidæ and other white fish are in their proper season. Their times of sickness are not so marked as to prevent many of the varieties from being taken all the year round. Different countries must have different seasons. We know, for instance, that it is proper to have the close-time of one salmon river at a different date from that of some other stream that may be farther south or farther north; and I may state here, that during several winter visits made to the river Tay, beautiful clean salmon were running in November and December! There are also exceptional spawning seasons in the case of individual fish, but we are quite safe in affirming that the sole and turbot are in season all the year round.

FISHING WITH LINES.

The White Fish Fisheries in Scotland—Buckie as a Fishing Centre—Steam Trawlers in the Firth of Forth—Fishery Wealth of Scotland—Irish Fishery Statistics—Machinery of Fish Capture—Cod Fishing in the North Sea—The Number of Hooks Required to Capture a Cargo of Cod Fish.

No organisation exists in Scotland for carrying on the white fish fisheries, as there is in the case of the oyster or herring fisheries. So far as our most plentiful table fish are concerned, the supply seems utterly dependent on chance or the will of individuals. A man (or company) owning a boat goes to sea just when he pleases. In Scotland, where quantities of the best white fish are caught, this is particularly the case, and the consequence is that at the season of the year when some white and flat fish are in good condition, they are not to be procured; the general answer to all inquiries as to the scarcity being, "The men are away at the herring." This is true; the best boats and the strongest and most intelligent fishermen have removed for a time to distant fishing-towns to engage in the capture of the herring, which forms, during the summer months, a noted industrial feature on the coast of Scotland, and allures to the scene all the best fishermen, in the hope that they may gain a prize in the great herring-lottery, prizes in which are not uncommon, as some boats will take fish to the extent of two hundred barrels in the course of a very few days. Only a few decrepit old men are left to try their luck with the cod and haddock lines; the result being, as I have stated above, a scarcity of white and flat fish, which is beginning to be felt in greatly enhanced prices. An intelligent Newhaven fishwife recently informed me that the price of white fish in Edinburgh—a city close to the sea—has been more than quadrupled within the last thirty years. She remembers when the primest haddocks were sold about one penny per pound weight, and in her time herrings have been so plentiful that no person would purchase them.

We shall not soon look again on such times.

Cod and haddock fishing is a laborious occupation. At Buckie, a quaint fishing-town on the Moray Firth, it is one of

the staple occupations of the people. At that little port there are generally about thirty or forty large boats engaged in the fishery, as well as a number of smaller craft used to work inshore. These boats, which measure from thirty to forty feet, are, with the necessary hooks and lines, of the value of about £120. Each boat is generally the property of a joint-stock company, most of the members being of the same blood, and has a crew of eight or nine individuals, who all claim an equal share in the fish captured. The Buckie men often go a long distance, forty or fifty miles, to a populous fishing-ground, and are absent from home for a period of from twenty to thirty-six hours. At many of the fishing villages from which herring or cod boats depart, there is no proper harbour, and at such places the sight of the departing fleet is a most animated one, as all hands, women included, have to lend their aid in order to expedite the launching of the fleet, as the men who are to fish must be kept dry and comfortable. Even at places where there is a harbour, it is often not used, many of the boats being drawn up for convenience on what is called the boat-shore. At many places on the coast, several of the boats are still drawn up in this rude way, and the women not only assist in launching and drawing up the boats, but they sell the produce taken by each crew by auction to the highest bidder—the purchasers usually being buyers on speculation, who send the fish by train to Edinburgh, Manchester, or London. The labour of the Scottish fishermen is greatly augmented by the want of good harbours for their boats. Time and opportunity serving, the men of the fisher class are really industrious, and this want of proper harbourage is a hardship to them. It is curious to notice the little quarry-holes that on some parts of the Moray Firth serve as a refuge for the boats. There is the harbour of Whitehills, for instance: it could not be of any possible use in the event of a stiff gale arising, for in my opinion the boats would never get into it, but would be dashed to pieces on the neighbouring rocks. I have witnessed one or two storms on the north-east coast of Scotland, and shall never forget the scenes of misery these tumults of the great deep occasioned.

From the little ports of the Moray Firth, the men go long distances to fish for cod and ling. As they have none but open boats, it will easily be understood that they live hard upon such occasions. They are sometimes absent from home for a couple or three days at a stretch, and as the weather is often very inclement the men suffer severely. The fish are not so easily procured as in

former years, so that the remuneration for the labour undergone is totally inadequate. A large traffic in living codfish used to be carried on from Scotland; quick vessels furnished with wells took the cod alive as far as Gravesend, whence they were sent on to London as required.

Three or four years ago a new departure took place in white-fish fishing in the Firth of Forth, by the employment of steam trawlers. These vessels are proving most successful, and are likely to be copied elsewhere. It is surprising, indeed, that they have not induced the trawl owners, at more southern ports, to try the effects of steam power in the North Sea trawl fleet. I have no doubt in my own mind the time is not far distant when nearly every fishing boat on the sea will be propelled by steam driven machinery.

So far as the fishery wealth of Scotland is concerned, the Scottish fishery board has published a series of figures representing the value of the fish of all kinds taken by Scottish fishing craft. The following is the portion of the report devoted to these statistics:—

The estimated value amounts to the total sum of £3,286,242. The herring fishery takes the principal place, no less than 1,269,412 barrels of herrings having been cured last year, in addition to those which were sold fresh, the value of both being reckoned at £2,053,551. Of the fish sold fresh, as regards quantity and value, the haddock holds the leading place; of it 543,568 cwts. were caught, the value thereof being £340,693. Next as regards quantity comes the cod, then the whiting, then the flounder, the values of which being £81,376, £41,851, and £48,409 respectively. The value of the shell-fish taken was £82,945, which included 281,569 cwts. of mussels, 35,393 cwts. of crabs, 7,498 hundreds of lobsters, and 6,456 hundreds of oysters.

I cannot say much about the white-fish fisheries of Ireland from personal knowledge, but the last report of the Irish fishery inspectors that for 1883, contains some interesting information on the subject which I have abridged for the benefit of my readers. From this report we are able to glean that during the last year the Irish fisheries were in a tolerably prosperous condition, there having, in particular, been a large increase in the take of herrings in 1883 as compared with the catch of the two previous herring fishing seasons. The Inspectors are not able to give details of the entire catch of these fish on the Irish coasts,

as the returns made to them only embrace certain localities ; the quantities taken in the places named, however—of which Kinsale affords about half the fish—reached altogether 109,280 mease of 600 each ; the value of which, estimated by the inspectors, is £105,738. The takes in 1881 and 1882 were respectively 47,072 and 70,457 mease, each mease containing the regulation quantity of 500 herrings. It would be interesting to have as detailed returns of the Irish herring fisheries as we now obtain of the Scotch. It is stated in the present report, [1883] that with adequate means of capture and better harbour accommodation the herring fisheries of Ireland would yield a large return, and the inspectors add that “ the herring fishing is assuming large proportions off the southern coasts, and it is confidently anticipated that before any great length of time it will be very considerable along the coast as far as, if not beyond Dingle, county Derry.” The number of Irish boats in this department of Irish fishing industry, it is gratifying to know, is annually increasing.

The catching of mackerel is one of the favourite fishing industries of the Irish—these fine fish are abundant in the seas which surround the Emerald Isle, and were caught in very large numbers in 1883, the take realising the handsome sum of £170,624, whilst a very large number of Irish boats now take part in the fishery. The number of fish chronicled as having been captured last season was 29,157,000, but these figures only embrace a portion of the Irish mackerel catch ; they only show the number captured principally off the coasts of Cork and Kerry from 1st March to 1st July, when the fish are found in vast shoals and of fine quality. During other months of the year great quantities are captured on different parts of the coasts, but of these catches reliable statistics cannot be obtained. By means of the mackerel fishery a very considerable number of persons obtain during many weeks remunerative wages.

No statistics are given by the inspectors of the take of other round fishes, nor of the number of flat fishes which are annually captured, but we are shown in another part of the report that during last year 46,961 boxes of cod fish, each containing 2 cwt., were exported from Ireland to England, the value of that quantity being set down at £65,745. The Irish seas abound with the best food fishes, such as turbot, sole, haddock, halibut, hake, ling, &c., and it would be well if we could ascertain what number of these are caught. The Irish salmon fisheries, like

those of England and Scotland, experienced a good time in 1883, the yield of salmon having been abundant, 59,171 boxes of 150lb, each having been exported to England, whilst the stock of these fish for spawning purposes was numerous and healthy. Salmon was sold locally in Ireland last season at a cheap figure, and in consequence was in great demand. At some periods of the fishery the price was as low as sixpence per pound weight. The money value of the Irish salmon sent to England, estimated all over at one shilling per pound, amounted to £443,782. 10s.

The oyster fisheries of Ireland, so far as the natural scalps are concerned, make no show in the report, but the fattening of French molluscs on the private layings has become of importance, the quantities imported for fattening being now very large, that kind of business, when it is properly attended to, being remunerative. Lobsters are found on the Irish coasts in large numbers and find a ready market in England. It appears, from the figures given, that the population engaged in the fisheries last year was under the number employed in the previous season, which is attributed to an increase in the stream of emigration; but, according to the inspectors, it is somewhat difficult to obtain a reliable account of the number of persons actually engaged in the work of fishing in Ireland.

Prolific as our coast fisheries have been, and still are, comparatively speaking, the North Sea is at present the grand reservoir from which we obtain our white fish. Indeed, it has been the great fish-preserve of the surrounding peoples since ever there was a demand for this kind of food. All the best-known are to be found in the German Ocean—Faroe, Loffoden, Shetland, and other places nearer home—and its waters, filling up an area of 140,000 square miles, teem with the chief kinds of fish, and give employment to thousands of people, as well in their capture and cure as in the building of the ships, and the development of the commerce incidental to fishing enterprise.

It will doubtless be interesting to my readers to be told something about the general machinery of fish-capture, so far as regards the British sea-fisheries. The modern cod-smack, clipper-built for speed, with large wells for carrying her live fish, costs £1500. She usually carries from nine to eleven men and boys, including the captain. Her average expense per week is £20 during the long-line season in the North Sea; but it exceeds this much if unfortunate in losing lines. Fishing is nearly always a most uncertain venture. The line is chiefly used for the purpose of tak-

ing cod and haddock. The number of lines taken to sea in any boat depends upon the number of men belonging to the particular vessel. Each man has a line of 50 fathoms (300 feet) in length; and attached to each of these lines are 100 "snoods," with hooks already baited with mussels, pieces of herring or whiting. Each line is laid "clear" in a shallow basket or "skull"—that is, it is so arranged as to run freely as the boat shoots ahead. The 50-fathom line, with 100 hooks, is in Scotland termed a "taes." If there are eight men in a boat the length of line will be 400 fathoms (2400 feet), with 800 hooks (the lines being tied to each other before setting). On arriving at the fishing-ground the fishermen heave overboard a cork buoy, with a flag-staff fixed to it about six feet in height. The buoy is kept stationary by a line, called the "pow-end," reaching to the bottom of the water, and having a stone or small anchor fastened to the lower end. To the pow-end is also fastened the fishing-line, which is then "paid" out as fast as the boat sails, which may be from four to five knots an hour. Should the wind be unfavourable for the direction in which the crew wish to set the line they use the oars. When the line or taes is all out the end is dropped, and the boat returns to the buoy. The pow-end is hauled up with the anchor and fishing-line attached to it. The fishermen then haul in the line with whatever fish may be on it. Eight hundred fish might be taken (and often have been) by eight men in a few hours by this operation; but many fishermen now say that they consider themselves very fortunate when they get a fish on every five hooks on an eight-taes line. Many a time too the fish are all eaten off the line by "dogs" and other enemies, so that only a few fragments and a skeleton or two remain to show that fish have been caught. The fishermen of deck-welled cod-bangers use both hand-lines and long-lines such as have been described. The cod-bangers' tackling is of course stronger than that used in open boats. The long-lines are called "grut-lines," or great-lines. A complete *suite* of lines requires the amazing number of 4680 hooks—the lines extending to 7200 fathoms. Cod-fishing in the North Sea is angling on a gigantic scale. Every deck-welled cod-banger carries a small boat on deck for working the great-lines in moderate weather.

As soon as the cod and haddock are taken off the hook they are put in a "well," formed by a part of the smack's hold, divided from the rest of the vessel by water-tight bulkheads. The well occupies the whole breadth of the vessel, and the sea

has free access to it through auger holes bored in the sides and bottom of that part of the smack. When the well has been sufficiently stored, the vessel returns to port with her cargo of live fish, which are then transferred to chests, in which they are kept afloat, and in good order, till wanted for market. Some hundreds of these cod, according to the demand, are taken out of the chests every afternoon, and after being killed by one or two blows on the head, are sent by train to Billingsgate and other markets, where they are sold as "live-cod," and fetch the highest price given for that kind of fish. A large number of cod are brought home alive in welled vessels in the way described, whilst others of the fish are crimped. They are first of all stunned by a blow when they are caught, and then laid down in cages from which they are only removed in order to be crimped.

BAIT.

Different kinds of Bait—Limpets—Cost of Bait for a Voyage—Gathering Mussels in Scotland—Herring as Bait—Waste of Bait.

HUNGRY cod fish will seize any kind of bait, and great lines are now often baited with bits of whiting, herring, haddock, or almost any kind of fish. For hand-lines the fishermen prefer mussels or whelks. Another kind of bait used by the boat fishermen for hand-lines is the well-known lug worm. The lug is a sand worm, from four to five inches long, and about the thickness of a man's finger. The head part of the worm is of a dark brown flaky substance, and is the part used as bait, the rest of the worm being nothing but sand.

One of the fishery problems of the period which seems somewhat difficult of solution is how fishermen are to keep up their supplies of bait. So many vessels are engaged in the line fisheries, and the hook power is now so enormous, that the energies of all interested have to be strained in order not to retard the work of the fisheries by long delays in waiting for whelks and mussels, the latter mollusc in particular being a favourite bait with Scottish line fishermen. At the risk of some trifling repetitions I shall here summarise "the bait question," as I call it.

In the article "Mollusca," in the new edition of the "Encyclopædia Britannica," it is stated that on the coast of Berwickshire alone twelve millions of limpets are annually used for bait. But great as the consumption of the limpet for this purpose may seem, it does not represent even half the quantity of bait required for carrying on the line fishery in the district mentioned; because for the winter fishery at Eyemouth, not to speak of Berwick-on-Tweed and Burnmouth, there is usually required from 700 to 1,000 tons of mussels, which have to be brought from Boston, in Lincolnshire, at a cost of about £2 per ton. Last year the boats of Eyemouth caught, in a period of nine months, haddocks of the value of £13,000; the bait used in the taking of these fish being mussels obtained at a cost of £1,800. When the immense number of hooks now carried by each line fishing-

boat is taken into account, even twelve millions of limpets will not go very far. A North Sea codman, as has been stated, carries a suite of lines which extends 7,200 fathoms in length, and has usually fixed upon it the amazing number of 4,680 hooks, every one of which must be baited at a cost of one shilling per line. It will be apparent, therefore, if we divide the 12,000,000 of limpets which Professor Ray Lankester says are annually used on the coast of Berwickshire by 5,000 (which will allow for damaged animals), it only affords 200 casts for each million of limpets, or 2,400 casts in all; which, when divided among a fleet of thirty or forty boats voyaging in search of haddocks or codfish once or twice every week for a period of from seven to ten months, gives but a comparatively small portion to each.

The cost of bait for each voyage of a North Sea-liner may be set down at an average of about £15, which for a fleet of, say, one thousand vessels, represents the considerable amount of £15,000; and if each of these boats make only ten long voyages in the course of a season, the sum thus expended on bait will amount to £150,000. These figures are, of course, offered simply by way of illustration. As fishing by means of baited hooks goes on all the year round, either by means of "long" or "hand-lines," the providing of bait is becoming a very important matter. In fact, it has given rise to an industry within an industry. Whelks are largely used by Great Grimsby and other cod-men; they are caught in various ways, their collection giving employment to a large number of persons. As indicating the quantity of "buckies" used each year, it may be stated that when a cod-smack starts on one of its voyages for what is called the long-line fishing it carries about forty "wash" of whelks in bags in its well: a "wash" being a measure equal to twenty-one quarts.

On the Scottish seaboard the gathering of bait used to be an industry of great pith and moment, and to-day the great delay in procuring bait often keeps the men at home when they would willingly be at sea. Formerly the women and children of every fishing community were to be seen daily on those portions of the coast left bare by the sea, engaged in gathering mussels for the lines. Scottish fishermen have long been wedded to the mussel, as they consider it the very best bait that can be used for the purposes of fish capture. The labour undergone was all the harder, as the women and children often required to trudge a distance of four or five miles, when having filled their creels

with the coveted mollusc, they had to walk home again with their heavy loads, after which each family would have to bait perhaps, a thousand hooks to be ready against the time of the men's departure for the fishery. Now when all the accessible mussel supplies have been used up the men have to procure their bait from private mussel beds at considerable cost. As showing the quantities of bait used, it has been computed that at Newhaven on the Firth of Forth, where four deep sea boats and sixteen small craft are fishing, the annual supply of mussels required is 3,456,000. As indicating still more fully the quantities of bait required, the following information from the pen of the fishery officer at Eyemouth is not without interest, "last week the deep sea fishing boats fishing from Burnmouth, Coldingham, and Eyemouth, used for baiting their lines 61 tons of mussels, the cost of which was about £160, the produce in fish from which was 25,620 stones chiefly haddocks, worth £2,500."

At Montrose, in Scotland, there has long been established a very productive suite of beds founded on a natural scalp. In the River Clyde there are also productive places; but they cannot be used by all and sundry, being private property. The impediment to fishing-work caused by an occasional scarcity of bait is considerable, and sometimes keeps the men at home on days when they would far rather be at sea.

The Scottish fishermen have lately found out that hungry haddock and codfish will eat other things than mussels and whelks: pieces of herring, for instance. Now, herrings can be procured in their season in tens of thousands; and as one of these would suffice to bait many hooks, it would perhaps be as cheap in the end to bait with herring as with any kind of shell-fish. Of course it is all a question of profit and loss. The Dutch very often use the lampern for bait, importing quantities of these animals from England for the purpose; in America the menhaden has been largely employed in the same way. It is curious that our fisher-folk should import bait-mussels from Hamburg and export bait-lampers to Holland, but so it is. Several Scotch line-fishers have been using cuttle-fish as bait with extraordinary results. A recent trial with two sets of lines, baited respectively with cuttle and herring, resulted in £7 for the cuttle and 16s 10d. for the herring! On another occasion, a trial of the cuttle bait resulted in the receipt of £25 for two shots. If cuttle-fish can be obtained in sufficient quantity, and at no great cost in time or money, it will be a great boon to the men, and

we shall have another proof of the superiority of the mollusca as bait which intelligent fishermen have long maintained : it is one of their most deep-rooted " prejudices."

The waste of bait in fishing is much larger than is generally known. The fishermen cannot help themselves in this matter : they do not know till they draw their lines whether they have captured a score of small haddocks, worth about fourpence each or twenty fine codfish which may bring them a five-pound note. Hence the greater profitableness of trawl-fishing, which requires no bait ; and besides, a trawler can be worked with fewer hands than a cod-man.

THE BAIT QUESTION : MUSSEL FARMING.

Aiguillon, where it is—Walton the Discoverer of Mussel Farming—Bird Catching—How the Bouchots were Invented—The Pirogue—Theory and Practice of Mussel Farming Described—Co-operation—Statistics—The Round of Work—Distribution of the Mussels—*L. s. d.* of Mussel Farming.

It is somewhat surprising that no attempt has yet been made in this country to cultivate mussels. I shall now try to show how that may be done—that is, how the mussel may be systematically grown, *a la francaise*, how our fisher folks may in some degree, at all events, obviate the hard work and great expense connected with the gathering or buying of this favourite bait, and how they may produce a large quantity of mussels for sale as well. Our fishermen, it is to be hoped, may by and bye come to grow their own mussels, as do the industrious men of Aiguillon; and if they do not turn mussel-farmers after what I have to tell them of my visit to the mussel-farm of that place, they will have themselves to blame for the ultimate extinction of the mussel, for, as is natural enough, the original scalps are giving way under the present increasing demand for bait.

"Where is Aiguillon?" was naturally enough the first question I had to answer, after determining to visit the great French mussel-farm; but no one could answer it. I asked many who are interested in fishery matters, but none of them had heard of the mussel-farm. Aiguillon, they said, was mentioned in Murray's Guide, and doubtless the site of the fishery would be there. But the mussel-farm is not at the Aiguillon mentioned by Murray, which is a town, of nearly two thousand inhabitants, on the left bank of the Lot, about a mile above its influx into the Garonne. My Aiguillon, indeed, is not even on the same line of railway, although it is at an equally great distance from Pall Mall. In fact, Murray has a soul above mussels, and, to speak the truth, doesn't even seem to care much about oysters, seeing that he sometimes neglects to mention localities where they are grown in the greatest profusion. I found my Aiguillon at the port of Esnandes, which is itself a curious out-of-the-way place.

In order to see the mussel-farm, it is necessary first to get to Paris, and to take the Orleans Railway to Poitiers, then to change to the line for La Rochelle, after reaching which place a *voiture* must be hired for the rest of the journey, Esnandes being about seven kilomètres from Rochelle. I need not weary the reader with a description of all that is to be seen on the Orleans Railway, which, as all the travelling world at least knows, runs through the most historical part of France. Looking from the window of the railway carriage, I enjoyed for a few hours the lovely champaign scenery of the claret district of France. There are vine-fields and big joint-stock walnut trees, and cherry orchards—and cherry orchards, walnut trees, and vineyards, over and over again, all the way to Bordeaux. Then there are little patches of water ; and dark-green grassy quadrangles laid down every here and there, guarded by those tall alder trees one sees in such profusion all over the Continent. Every here and there, too, may be seen a distant château on its finely-wooded hill ; then come a few old farmhouses, their inner yards alive with the minute industry of the plodding husbandmen. Anon we pass the outskirts of old historical districts, tempting one to break one's journey.

It might have well suited others to perform these pleasures of travel ; my errand was to see *la moule*. History had no charms for me till I had seen the mussel-farm which I had come so far to visit. To my exceeding astonishment, almost no one in La Rochelle knew anything about the industry of Aiguillon. I had to search far and wide to obtain information as to how to get to the place ; another exemplification of the old story, that one may live all his life in London, and not be able to find his way to St. Paul's. By virtue of a little Scottish perseverance, and the expenditure of much bad French, I at length found out that it was at Esnandes that they cultivated *la moule*. So, procuring a *voiture*, and a *garçon* to drive it, I sallied away out through the gates and barriers of La Rochelle ; and after a pleasant drive through the vineyards and small farms of the district, on each of which there appeared to be a little flock of black sheep, I arrived in about an hour's time at my destination, much to the astonishment of the idle poultry and young dogs of the neighbourhood, which looked and acted as if they never had seen a *voiture* or a Scotchman before.

The port of Esnandes is very much like all other fishing-villages, and the fisher-people like all other fishing-people. As

you enter the town, you feel that it has the usual ancient and fish-like smell ; and you see, as you suppose, the same little boys clad in overgrown small-clothes that you meet with in the fishing villages of England and Scotland. After passing a little way down the one street of the village, you observe all the way, right and left, the invariable mussel-middens, the worn-out old fish-baskets, and the various other insignia of the trade of the people, the like of which you can also see at Whitstable or Cokenzie. The people waken up the moment it is buzzed about that a stranger has arrived. At first, I thought the population were all out at sea, but I was so quickly surrounded by an inquisitive little crowd, that I speedily gave up that idea ; and as soon as I had explained my errand to the buxom lady of the village café, I was provided with a guide, who kindly escorted me to the *bouchots* (fishing hurdles), or rather to the dépôt of the boucholiers, which is about a quarter of a mile from the village.

Having alighted from the carriage, I looked around me with some curiosity ; but I saw no farm of mussels, no appearance even of there being a common fishery. About a mile away to the right there was moored a small fleet of the common flat-bottomed fishery-boats peculiar to the coast. A few miles to the left lay the Ile de Ré, famous for its oyster-beds ; but where was the object of my search—the mussel-farm ? Well, to make a long story short, the farm was at that particular hour covered with water ; but, as the tide was on the ebb, I speedily obtained a view of the vast mud-fields to which the people of Esnandes are indebted for their peculiar fish-commerce. The story of the translation of these vast sloughs of mud into fertile fields of industry, productive of comfort and wealth, is short and simple. The discovery of the bouchot was purely accidental. An Irish vessel, laden with sheep, having been wrecked in the bay, so long ago as the year 1235, only one out of all the crew was saved. This man's name was Walton, and he became the founder of the present industry by means of the bouchot system of cultivation. On finding himself saved, he at once set about discovering a means of earning his own food, so that he might not be a burden upon the poor fishermen who had rescued him from the ravening waters, and who were themselves at the time well-nigh destitute of every comfort of life.

All around him, however, as Walton soon perceived, was one vast expanse of liquid mud, and what could any man do on such

a barren field? Walton speedily solved the problem. He first of all invented a mode of travelling upon the mud-bed, for walking was an impossibility, as at every step he sank up to the knees in the miry clay. This boat is called a *pirogue* by the boucholiers, and it is still in use. By means of this simple machine, which I will by-and-bye describe, Walton was able to travel along and explore the muddy coast, by which he found out that vast numbers of land and sea birds used to assemble on the waters and in the mud in search of food. A kind of purse-net for the capture of these birds at once suggested itself to the hungry sailor. This being made and set on the mud as a trap to float with the tide, was found to answer admirably, and every night large numbers of aquatic birds were captured in its purse-like folds. It was out of that little example of a destitute sailor's ingenuity that the present industry of Aiguillon was developed, for it was not long before Walton found the strong posts to which he had affixed his net all covered over with the spawn of the edible mussel; these he found grew very rapidly, and when mature, had a much finer flavour than the mud-grown bivalves from whence the spawn had floated. The Irishman soon saw how he could multiply his own food-supplies, and create at the same time a lasting industry for the benefit of the poor people among whom he had been thrown by his unfortunate shipwreck; he therefore went on multiplying his stakes, till he found that there was no end to the produce; so that in due time this accidental discovery became a rich inheritance to the fisher-folks of the district, for in ten years after the shipwreck the bay was covered with an appropriate and successful mussel-collecting apparatus, out of which has grown the present extensive commerce.

The work of cultivation at Aiguillon is carried on very systematically. I shall give what I learned about it, just as I saw it myself, or as it was described to me by my guide, a very civil and immensely voluble fisherman, who had the whole theory and practice of mussel-farming at his finger-ends, or rather at the end of his tongue. It was truly curious to consider that the same mode of cultivating and working was going on that had prevailed from the beginning—the invention having been perfect from the first. One of the most curious phases of the whole industry is the mode of progression over the fields which has been adopted by the men, for each man has not only to paddle his own canoe on these soft fields of mud, but if he

have a visitor, he has to paddle his boat as well. The manner of progression is very primitive. The man kneels in his little wooden vessel with one leg, the other, being encased in a great boot, is fixed deep in the mud; a lift of the little canoe with both hands, and a simultaneous shove with the mud-engulfed leg, and lo! a progress of many inches is achieved; this action, frequently repeated by the industrious labourers, soon overcomes the distance between the different fields; and when a new *trousseau* has to be carried out to the bouchots, or a stranger has to be conducted over the fields, two men will load a canoe, and work it out between them, not, however, without a few jolts and jerks, which, like a ride on a camel's back, is rather tiring to the unaccustomed. When three of the canoes are joined together by means of pieces of stout rope, the boucholier in the first one uses his left leg as the propelling power, while the man in No. 3 uses his right leg, and by this means they get along in a straighter line and with greater speed. This peculiar boat-exercise has not a little of the comic element in it, especially when one sees a fleet of more than a hundred narrow boats all propelled in the same eccentric manner by upwards of one hundred merry boucholiers. I may mention that the mud at Aiguillon is unusually smooth and soft; there are no sun-baked furrows to interrupt the progress of the canoe, a fact that is due to the presence of a little animal, which accomplishes for the boucholier what a regiment of a thousand soldiers might not have been able to perform.

In addition to the large and strong stakes originally used as holdfasts for his bird-nets, Walton planted others, in long rows, in the form of a double V, with their apex open to the sea, the sides being interlaced with branches of trees, to which the mussels, by means of their byssus, affixed themselves with great aptitude. These bouchots were also arranged one with another so as to serve as traps for the taking of such fish and crustaceans as frequent the coast; so that the fishermen had thus a double chance, being, of course, always assured, when there is no fish, of a canoeful of mussels.

The men in search of fish depart for the farm a little time before the tide recedes, and taking their places at the mouth or apex of the V, they affix a small net to the opening, so that they are sure to intercept any fish that may have come in to feed with the previous tide. I made very particular inquiries into the constitution of the farm, and although disap-

pointed at not finding it, as I was led to expect, a vast scene of perfect co-operation, I was pleased to learn that, although the bouchots had many owners, there was no violent competition among those who owned them. Some of these mussel-farmers have three or four bouchots, and the very poorest among them have a half, or at least a third share in one. The system of family co-operation prevails very largely ; I found, as in the case of the celebrated walnut-trees, so often quoted, that one or two families, grandfathers, sons, and grandchildren, were often the owners of several bouchots, which they worked for their joint benefit, dividing the profits at the end of the season.

The farm occupies a very large space of ground, equal to eight kilomètres, and is laid out in four fields or divisions, each of which has its peculiar name and use. There are at least 500 bouchots, and each one represents a length of 450 mètres, forming a total wall of strong basket-work, all for the growth of mussels, equal to a length of 225,000 mètres, and rising six feet above the mud-bed on which it is erected.

Great pains are taken to keep the bouchots in good order ; repairs are continually being made ; and along the protecting wall of the cliff by which the bay is bounded, there are to be seen what my guide called the *trousseau* of the bouchots—great strong wooden stakes twelve feet long, and of considerable girth. These are sunk into the mud to a depth of six feet, the upper portion being the receptacle of a garniture of strong but supple branches, twisted in the form of basket-work, on which are grown the annual crops of mussels. The bouchots have different names, according to their uses and their situation. The *bouchots du bas* are those farthest away in the water : they are very seldom left uncovered by the tide ; they are formed of very large and very strong solitary stakes, planted so near each other that there are three of them to each mètre. The duty of these stakes is to enact the part of spat-collectors—the spat is locally called *naissain* at the Port of Esnandes—so that there may be always a store of infant mussels for the peopling and re-peopling of such of the palisades as may accidentally become barren. My guide, in describing to me the operations of the farm, used agricultural terms, such as seeding, planting, transplanting, replanting, etc., and he told me that operations of some kind are continually going on all over the farm. When it is not seed or harvest time, the bouchots have to be repaired or the canoes mended.

As near as I could understand, the spat of the natural mussel

which voluntarily fixed itself to the outer rows of posts, attains about February or March to the size of a grain of flax-seed. In May the young mussels are about as big as a lentil, and in about two months more they will attain to the dimensions of a haricot bean—the men of Esnandes then call the mussel a *renouvelain*—which is the proper time for the planting to begin ; and this operation was in progress during my visit. It is simple but effective. When a few canoe-loads of these young mussels are required for the seeding of the more inland bouchots, the men proceed to the single or collecting stakes at the lowest state of the tide, armed with long poles, having blunt hooks at the end, by means of which they scrape off the seedlings. The men do not, however, scrape off more of the mussels than they require for the operation in hand, which must be completed before the flow of the next tide. Having filled a few baskets, each man paddles his canoe to the seat of work, and there commences the first stage of the work or planting, which is effected in a curious but characteristic way, the operation being called *la lâtisse* by those engaged in it. Taking a good handful of the mussels, they are skilfully tied up by the boucholier in a bag of old netting or canvas, and then deftly fastened in the interstices of the palisades, or bouchot basket-work, each group of mussels being, of course, fastened at such a distance as to have plenty of room to grow. Left there, the byssus of the animal soon forms a point of attachment ; and the bag rotting away by means of the water, speedily leaves the mussels hanging in numerous vine-like clusters on the bouchots, where they increase in size with such great rapidity, as speedily to demand the performance of the next operation in mussel-culture, which is called the transplanting. It is conducted with a view to the attainment of two ends ; firstly, the thinning of overcrowded bouchots ; and, secondly, to bring the ripe mussels gradually nearer to the shore, so as to make their removal all the more easy at the proper time. The change of habitation is effected precisely as has already been described ; the mussels are again tied up in purses of old netting, although not so particularly as before ; again the mussel, whose power in this way is well known, weaves itself a new cable, and the bivalve clings to its new resting-place as tenaciously as ever. It may be asked, why the mussel-farmers should so plant the mussels as that they will require constant thinning ; but the reason is, that it is desirable for the purpose of their proper fattening that the mussels should be always, if

possible, covered by the salt water ; this, however, is not compatible with the extent of the crop ; but all that can be done is done, and the mussels are kept in the front-ranks as long as possible. A third and last change brings the mussels as near the shore as they can ever get, so long as they are ungathered.

The labour of planting and transplanting goes on incessantly, till all the spat that had found a resting-place on the solitary stakes—that is, the advanced guard—has been dealt with. The labour of all these varied operations is constant, and is carried on by old and young, male and female, both day and night, at times when the tide is suitable. Some portions of the farm are always under water ; other portions of it, again, are uncovered at the ebbing of the tide ; and this circumstance, I was told, has a great influence on the quality of the mussel ; those being the best, as may be supposed, which are longest submerged, and kept at the greatest distance from the mud. Although the greatest possible care is taken to keep the mussels from being affected by the copious muddy deposits of the place, by means of allowing a good flow of water between the base of the bouchots and the sea-surface, yet some of the bunches become deteriorated, in spite of all the precautions that can be taken. This, of course, distresses the boucholiers, as one of their points is the superior flavour of their produce ; indeed, it was the superiority of the mussels, as discovered by accident through Walton's bird-net, which was set so as to float high above the mud—the quality of the mussel more than the quantity—that influenced Walton to commence as a mussel-farmer ; and to this day it is still quality more than quantity that the boucholiers study at Esnandes. After the process of about a year's farming has been undergone, the mussels are considered to be ready for the market, and by the care of the farmer, the mussels are in season all the year round, although, of course, not so good for food at some periods of the year as at others ; thus, Aiguillon mussels are not so fine in the spring months as they are in the autumnal periods of the year, when they become deliciously fat and savoury ; indeed, I can bear testimony, having had a feast of them, to the fact of their being better, larger in size, and more pronounced in their flavour, than any of the British mussels I have tasted. About April the mussels become milky and unpalatable, although there are still many branches of them fit for the market. It is in the months between July and January that the great harvest goes on, and the chief money-business is

done. If the mussels are to be sent to a distance, they are separated and cleared from all kinds of dirt, packed in hampers and bags, and sent away on the backs of horses or in carts; while those required for more local consumption are kept in pits dug at the bottom of the cliff, and within the enclosure where the men keep the trousseau of the bouchots. There are no less than a hundred and forty horses and about a hundred carts engaged in the trade; and the mussels are distributed within a radius of about a hundred miles of Esnandes, more than thirty thousand journeys being made in the service. In addition to this land-carrying, forty or fifty barques are in the habit of visiting the port, to bear away the mussels to still greater distances, making in all about seven hundred and fifty voyages per annum.

Does the mussel-farm pay? will, of course, be asked by practical people. Yes, it pays. I have obtained the following figures to show that mussel-farming pays very well, not to speak of what is obtained by the round and flat fish which are daily captured through the peculiar construction of the bouchots. Every bouchot will yield a load of mussels for each mètre of its length; and this load is of the value of six francs; and the whole farm at Esnandes is said to yield an annual revenue of about a million and a quarter of francs, or, to speak roundly, upwards of fifty-two thousand pounds per annum; and when it is taken into account that this large sum of money is, as nearly as possible, a gift from nature to the inhabitants, as there is no rent to pay for the farm, no seed—as is the case at the Whitstable oyster-farm—to provide, no manure to buy—only the labour necessary for cultivation to be given, British fishermen will easily comprehend the advantages to be derived from mussel-farming.

[Since my visit to Esnandes several changes have been made at the mussel-farm—more especially in the disposition of the *Bouchots*—but there is no difference in the mode of culture.]

TRAWLING.

Description of the Trawl Net—Objections to Trawling—Evidence Against and in Favour of Trawling—Philosophy of the matter—The Round of Work on Board of a Trawler described.

THERE has been a large amount of exaggeration as to the injury done to the white-fish fishery by the trawls. Fishermen who have neither the capital nor the enterprise to engage in trawling themselves are sure to abuse those who do ; but the trawl is so formidable as to have induced various writers to advocate its prohibition. They describe this formidable fishing instrument as terrible in its effects, leaving, when it is used, deep furrows in the bottom of the sea, and crushing alike the fry and the spawn ! but there is a very evident exaggeration in this charge, because as a general rule the beam-trawl cannot be worked with safety except on a sandy or muddy bottom, and, so far as is known, there are some fish which prefer to spawn on ground that is slightly rocky or weedy, so that the spawn may have something to adhere to, which it evidently requires in order to escape destruction ; and when a quantity of spawn is discerned on a bit of sea-weed or rock, we always find that, from some viscid property of which it is possessed, it adheres to its resting-place with great tenacity. Again, as has been shown, the spawn of the cod-fish and some other fishes floats upon water, so that the trawl cannot do it much, if any harm. The trawl-net, however destructive its agency, cannot, I fear, be dispensed with ; and, used at proper seasons and at proper places, with well regulated meshes, is the best engine of capture we can have for the kinds of fish which it is employed to secure. Having been frequently on board of the trawling ships, I may perhaps be allowed to set down a few figures indicative of the power of this great beam-net.

A trawler, then, is a vessel of about 35 tons burden, and usually carries 7 persons—viz. 5 men and 2 apprentices—as a crew to work her. The trawl-rope is 120 fathoms in length and 6 inches in circumference, and to this rope are attached the different parts of the trawling apparatus—viz., the beam, the trawl-heads, bag-net,

ground-rope, and span or bridle. The trawler is furnished with a capstan, sometimes worked by steam, for hauling in this heavy machine. The beam, a spar of strong elm wood, is 38 feet in length, and 2 feet in circumference at the middle, and is made to taper to the ends. Two trawl-heads (oval rings, 4 feet by $2\frac{1}{2}$ feet) are fixed to the beam, one at each end. The upper part of the bag-net, which is about 100 feet long, is fastened to the beam, while the lower part is attached to the ground-rope. The ends of the ground-rope are fastened to the trawl-beds and being quite slack, the mouth of the bag-net forms a semicircle when dragged over the ground. The whole apparatus is fastened to the trawl-rope by means of the span or bridle, which is a rope double the length of the beam, and of a thickness equal to the trawl-rope. Each end of the span is fastened to the beam, and to the loop thus formed the trawl-rope is attached. The ground-rope is usually an old rope, much weaker than the trawl-rope, so that, in the event of the net coming in contact with any obstruction in the water, the ground-rope may break and allow the rest of the gear to be saved. Were the warp to break instead of the ground-rope, the whole apparatus, which is of considerable value, would be left at the bottom. The trawler, as I noted while the net was in the water, usually sails at the rate of 2 or $2\frac{1}{2}$ knots an hour. The best depth of water for trawling is from 20 to 30 fathoms, with a bottom of mud or sand. At times, however, the nets are sunk much deeper than this, but that is about the depth of water over the great Silver Pits, 90 miles off the Humber, where a large number of the Hull trawlers go to fish. When they are caught, the fish (chiefly soles and other flat fish) are then packed in baskets called pads, and are preserved in ice until brought to market, or they may be sent off at once by the steam carriers that wait on the trawlers. To take twelve or fourteen pads a day is considered excellent fishing. Besides these ground-fish the trawl usually encloses haddocks, cod, and other round fish, when such happen to be feeding on the bottom. It sometimes happens that the beam falls to the ground, and the ground-rope lying on the top of the bag-net, no fish can get in. This accident, which, however, seldom occurs, is called a back fall. Mr. Vivian of Hull, in a letter to the editor of a Manchester newspaper, gave some years ago a very graphic account of the trawl-fishing, and stated that 99 out of every 100 turbot and brill, nine-tenths of all the haddocks, and a large proportion of all the skate, which are daily sold in the wholesale fishmarkets of this country, are

caught by the system of trawling. Trawling is without doubt the most efficient mode of getting the white fish at the bottom of the ocean ; and were it to be discontinued, London and the large towns would at times be entirely without fish. As a matter of course, trawling must exhaust the shoals at particular places. A fleet of upwards of 100 smacks, each with a beam nearly 40 feet long, trawling night and day, disturbs, frightens, or captures whatever fish are to be found in that locality, entrapping, besides, shell-fish, anchors, stores that have been sunken with ships ages ago ; even a wedge of gold has been brought up by this insatiable instrument. The only remedy is to widen the field of action and the—mesh.

It is best, however, in a case of dispute, as in the trawl question, to allow those interested to speak for themselves. I have gone over an immense mass of the evidence taken by a commission appointed by Parliament some years since to make inquiry on the subject, and will set some parts of it before my readers, so that, if a little trouble be taken in weighing the *pros* and *cons* of the matter, they may be able to form their own judgment of this vexed question.

A Cullercoats fisherman is very strong against the beam-trawl, He is certain that thirty years ago we could get double the quantity of fish, during the fishing season, that we obtain now and that the supply has fallen away little by little ; and he says that even ten years ago it was almost as good as it was thirty years ago. Some years hence England will cry out for want of fish if trawling be allowed to go on. The price of fish has doubled, he says, of late years. "When I was a young man, there were nine in family of us, and my wife could purchase haddock for twopence which would serve for our dinners. Now she could not obtain the same quantity for less than ninepence or tenpence. Of recent years the number of fishermen and fishing-boats has greatly increased. I do not think the fishermen of the present day are better off than those when I was a young man." The fishermen at Cullercoats, when they trawl, use the small trawl, and fish in shallow water. Under these circumstances they do no injury. The trawlers, with the large trawl, says a Mr. Nicholson who was examined, not only sweep away the lines of the fishermen, but also destroy the fish. At Cullercoats a man engaged in the line-fishing gets all the fish on his own lines, and his wife goes to town and disposes of them. The beam-trawling commenced about six years ago. The number of boats

and the fishing population still go on steadily increasing. Beam-trawling does two kinds of harm : in the first place, it sweeps away the fishermen's lines ; and next, it destroys the spawn. " There may be a remedy for a fisherman losing his lines, but I never heard of it. I am aware that they could recover damages, but the difficulty is to get hold of the offending parties. The only remedy I can suggest is to do away with the trawl-fishing altogether." This witness stated that ten years ago he used to take sixty or seventy codfish per day, and that now he cannot get one. The trawlers, being able to fish in all weathers, beat the local fishermen out of the field.

Templeman, a South Shields fisherman, says that when engaged in trawling he has drawn up three and a-half tons of fish-spawn ! He also says in his evidence that in trawling one-half of the fish are dead, and so hashed as to be unfit for market. Has seen a ton and a-half of herring-spawn offered for sale as manure. The take of fish upon the Dogger Bank has decreased very much. The fishermen cannot catch one quarter part there now that they used to do. The number of trawl-boats on the Dogger Bank has increased about 10 per cent. within the last year, and yet they are getting about a quarter less fish. Some of them can scarcely make a living now at all. They have impoverished all other places, and now they have come here, and in a short time there will not be a fish left. It is the same with the other fish-banks, and that accounts for the trawlers now coming to this neighbourhood. They have destroyed the Hartlepool and Sunderland ground, and now they have come to a small patch off here, and they will sweep it clean too. A trawl-boat will sometimes catch five tons a day ; but on the average a ton and a-half ; but as a great deal of that has to be thrown overboard, they only bring about ten cwt. to market. The boats belonging to Cullercoats, carrying the same number of hands as the trawlers, only catch upon the average about five stones. The fish caught in the trawl are not fit for the market, as the insides are broke, and the galls burst and running through them. " If I had my way I would pass an Act of Parliament to do away with trawling, and oblige every man to fish with hooks and lines. I think that would increase the quantity of fish for the country, because the young fish would not take the hooks. I am not aware that if the small boats get five stones a day it would at all diminish the supply of fish for the market ; but if the trawling is allowed to continue, that very soon will."

Thomas Bolam, on being examined, said : " I have followed the herring-fishing for twenty one years, and the white-fishing six years. In the course of those six years I have found that the supply of white fish has gradually diminished both in the number and size of the fish. In twenty years' experience in the herring-fishing I find a fearful diminution in the total quantity caught. The shoals of herring are now only about one-third the size they were when I first commenced the fishing. At that time we used to get 14,000 or 15,000; now the length of 4000 or 5000 is thought a good take. I attribute the falling-off to the existence of the trawling system."

Many other fishermen gave similar evidence. A fisherman named Bulmer, residing at Hartlepool, said that the white fish were not only scarcer, but that they were deteriorating in size as well. The falling off in quantity has decidedly been accompanied by a smaller size, more particularly in haddocks. Haddocks, twenty years ago, were caught from five pounds to six pounds in weight; now they hardly average three pounds. There is scarcely a single cod to be caught now, and formerly our boats got them scores together, and had to trail them out in rows, and could only sell them for about 10s. a score; now they realise at Christmas 5s and 6s each. "Of turbot-fishing I am sorry to speak. It pains me to think of the injuries we have sustained in this particular fishing by trawlers. At present we dare not cast our nets, as they are sure to be lost. I lost two 'fleets' of turbot-nets worth £25. About twenty-six years ago I have caught two hundred turbot in one day: now there are none to be got." Another resident gave similar evidence, and thought that if trawling was persisted in, their noble bay would soon be fallow ground. John Purvis of Whitburn also says that haddocks have decreased in size as well as in quantity—thinks they are at least a third smaller now as compared with former years. Considers that the trawling system has caused the diminution of fish which has taken place during the last four years. David Archibald of Croster had bought trawled fish not for food, as they were only fit to be used as bait.

Having given a fair sample of the evidence against the trawling system, it will be but just to hear the other side of the case. It is unfortunate, of course, that we cannot obtain really impartial evidence on this vexed question, as the party complaining is the party said to have had their fishery prospects ruined by the use of the beam-trawl, whilst the trawlers, of course, won't

hear a bad word said of the engine by which they gain their living. A Torbay fisherman, accustomed to trawling for the last twenty-six years, flatly contradicts much that has been said against the trawl-net. He asserts that he never took or saw any spawn taken, and that only about half a hundred-weight in each two tons of the fish taken is unfit for the market. He does not think the fish are decreasing either in quantity or size.

A Hull trawler spoke to the following effect :—"I never saw any spawn in the net. It is impossible for spawn to be caught in the net. There is often unmarketable fish, but it is only when there is a strong breeze and a difficulty on getting the gear on board. We generally get seven or eight hampers in a haul, and one basket would perhaps, be unfit for the market. The hooked fish is a more saleable fish, as it has got the scales and slime on it and the trawl fish has not got the slime on it, and the scales are sometimes rubbed off. Some haddocks were here produced which the witness said were a fair specimen. The scales were on them, and on one being opened the inside was found to be in an unbroken state.

The following is a summary of the evidence given by William Dawson, a very intelligent fisherman of Newbiggin, who spoke from fifty years' experience :—"He had fished cod, ling, turbot, and several kinds of shell-fish but not oysters. He was still engaged as a fisherman. He fished with a line for soles. The number of fishermen and boats had increased. In 1808 there were eight boats, and there are now about thirty boats. Fifty years ago the boats were about one third the size. The boats carried just about the same lines as now. The boats now carry about three times as much net as they did. The number of white fish is falling off a great deal. In 1812 every boat brought in more white fish than they could carry. We do not go much more frequently to sea now. In the size of the fish now there is not much difference—a little smaller. The haddock and herring fisheries had decreased. He had not noticed much difference in the size, only in the quantity. There was a greater number of boats engaged now in the herring-fishing—the number of herring having decreased within the last ten or twelve years. Little mackerel was caught there. Large quantities of mackerel were off this coast at times, but they had no nets to take them. Although a good many sprats were seen, they did not try to catch them. The cause of the falling off in the quantity of fish he considered was their being destroyed farther south.

No trawling vessels came here till last summer. They went about twelve miles from land, and trawled in the fishing-ground. The lines of the fishing-boats were parallel, and about a quarter of a mile apart. When there was a south-east storm they got plenty of fish, but it was not so now. With a north-east storm they had plenty of fish. In his recollection, fifty years back, there was plenty of fish with a south-east storm. There had been no interference with their nets, and no one had regulated the times of fishing. There might be some advantage if the Government made a law to prevent either the English or French fishing from Saturday morning to Monday night. That would give time for the fish to draw together. That alluded to herring. They should not allow the trawl-boats to fish on the coasts. The French boats often came within three miles of the land. Herring are caught within three miles of the shore. The French boats shifted with the herring along the coast, and have caught a great quantity. There should be a rule that herring-nets should not be shot before sunset. When the Queen's cutters came the French boats made off to more than three miles from the land. Lobsters had diminished, but not the crabs. He believed they had caught too many lobsters. The boat's crew is not so well off now as thirty years ago. Lodgings were better. They do not earn so much money now. In the course of a year (about 1825) he made £126, and a few years back he made only £78. The average for the last five years at the white fishing was about £50. Other £50 might be made at the herring-fishing. The buoys of the lines were large enough for the trawlers to see them, and they could see where the nets were. They destroyed both the fish and the lines. A line boat with fittings costs about £40, and a herring-boat with nets not less than £100. The men bought the boats with money saved. Little fish was destroyed on their lines, except what was eaten by the dog-fish. There were herring there in January and February, but were not caught. Their boats fished between Tynemouth and Dunstanborough castles. He could remember when there were no French boats on the coast; they first came about 1824. The French boats fish on the Sundays. Their boats did not. A young man ought to earn £100 a year. It would cost a full third to keep his boat and tackling up. The boats lasted about fourteen years."

I need not go on repeating similar evidence, but the witnesses were nearly all agreed that the beam-trawl did not do the injury

to the fisheries that was charged against it, especially as regards injury to spawn. I may, perhaps, by way of conclusion to this contradictory evidence, be allowed to quote from the *Times* a portion of a letter on trawling, written by a "Billingsgate Salesman:"—"Seven years' experience in Billingsgate, and my lifetime previous spent among the fishermen in a seaport-town, may enable me to offer a few remarks, which through your able abilities may be sifted, and perhaps leave a portion of matter which you may consider of some value and turn to some account. My personal interest is not only in trawl-fishing, but hook-and-line, seined-net, drift-net, and other kinds; for, being a commission agent, it is all fish that comes to my net. I cannot speak of the qualities of trawl-net fishing, either for or against, not having been connected with that branch of the trade, but after a remark or two on the information received by Mr. Fenwick, and which is conveyed in your columns from certain gentlemen professing to have a knowledge of the trade, I will give you my information as briefly as possible. The fact is this—it never will be possible to catch what we consider trawl-fish in sufficient quantities to meet the demand but by the trawl, the principal kinds being turbot, brill, soles, and plaice. A small quantity may be taken by other means, but more by accident than otherwise. As for trawl-fish being mutilated and putrid before landing, how does it happen that so many spotless and pure fish, out of the above kinds, are not only sold in London but all over the country, and exhibited on the tables both of rich and poor? Yourself and every nobleman can speak on this point; and when informed that they are all caught by the trawl (a fact undeniable), you will consider it wrong on the part of any one to mislead the public on a matter of so much importance. Advise him to fathom the secrets of the ocean, and discover a better mode to obtain them."

A great deal of obloquy has been thrown on the trawl, because it *hashes* the fish; but the destruction of young fish—that is, fish unfit for human food because of their being young—is not peculiar to the trawl. When the lines are thrown out for cod the fishermen cannot command that only full-grown fish are to seize upon the bait: the tender codling, the unfledged haddock, the greedy mackerel, *will* bite—the consequence being that thousands of sea-fish are annually killed that are unfit for food, and that have never had an opportunity of adding to their kind. But this mischance is incidental to all our fisheries, no matter

what the engine of capture may be, whether net or line. Look how we slaughter our grises, without giving them the opportunity of breeding! The herring-fishing is a notable example of this mode of doing business: the very time that these animals come together to perpetuate their species is the time chosen by man to kill them. Of course if they are to be used as food, they must be killed at some time, and the proper time to capture them forms one of those fishing mysteries which we have not as yet been able to solve.

Most of the North Sea trawlers work in fleets, each under the command of an admiral, who by means of signals directs the routine of the fishery.

The nightly round of trawl work throughout the fleet is pretty much as follows: at sunset, as a rule, as soon as the signal is given, the work of trawling begins by the net being let overboard. It is a gigantic chamber of horrors: for the fish, when once engulfed within its capacious maw, cannot easily escape, while all that are captured are kept—great and small, prime and offal, a circumstance which, we may be allowed to state in passing, is much to be regretted, as the smaller fishes ought to be allowed to escape. The heaving of this gigantic net overboard is, of course, a comparatively easy matter; not so the getting of it on board. When the trawl has been placed the men partake of supper; and the crew, except one man, go to sleep for a few hours, till the signal is given to begin work. It is usually about eleven o'clock when the admiral sends up a rocket to announce that the nets of the fleet must be once more got on board. This is labour of an exhausting kind. The writer has known three hours elapse before the ponderous machine has been got on board all right, the men working away with all their power of will and strength of muscle. The trawl, as soon as it is hoisted on deck, is emptied of its piscine riches, which on some occasions, when fortune has been more than usually favourable, make a formidable display of fine fish; but the fishermen have no time to expend in admiration. Many a naturalist, however, would really enjoy the scene, and be delighted with the crowd of curious creatures of quaint forms that are struggling for their lives. The first operation that the men perform is to assort or classify the fish into "prime" and "offal," which are the two classes known in the markets, although why haddocks and some other really good fish should be classified as *offal* is not easy to tell. Anything that is absolutely worthless is at once thrown

overboard ; but all the cruel dog-fish, which in some seasons are wondrously plentiful, are carefully killed, they "die game" as the fishermen tell us, unless when "settled at once," by a strong blow on the head, which is seemingly the most vulnerable part of all fish. Such fish as turbot and brill live a long time out of water, but soles die quickly ; it is astonishing, however, what a strength of vitality is exhibited by the smaller flat fish—which flop about for hours after they have been captured.

After a brief time elapses, the trawl is once more placed in the water for another shot, and is hauled in about break of day ; and while it has been at work the previous haul of fish have been more carefully gone over, and packed in trunks or boxes, to await the arrival of the steam clipper, which comes to the fleet to carry the produce to market. A rather dangerous part of the fishermen's work is the ferrying of these boxes from the smack to the steamer in a small boat—too small certainly for such work ; but as the fish must be got to market, the men must risk their lives, no matter how wild the water may be during the time that kind of labour is going on. The placing of the fish on board the steam carrier involves a great amount of work, as will be obvious enough when the reader is told that as many as 2800 trunks of fish will occasionally be brought to market by one of these steam clippers.

The preceding narrative presents only the merest outline of the labours undergone by the trawl fishermen during their spells of work, which vary in length in different districts, the number of voyages not being the same for every smack, nor are the rewards of labour always the same. As a rule the captain and perhaps his second hand share in the venture, and are remunerated according to the catch, but different smack-owners have different modes of dealing with their hands.*

It is impossible for me to give with any degree of accuracy the number of trawlers now at work in the North Sea or on the immediate coast line, but it is said there is now a fleet of 800 of these vessels sailing from the Humber—Hull and Great Grimsby ; these are all large, fine craft, much superior to the 24 and 35 ton vessels of "the olden time," as I may call it, and which I have noted at the beginning of this chapter as being in general

* "The Unappreciated Fisher Folk," by James G. Bertram. London, 1883.

use when I began my investigations into fishery matters. These comparatively small boats have been gradually replaced by others ranging up to 90 tons, with steam worked capstans and other modern appliances and improvements. Such vessels frequently remain out for twenty-five days, "getting the voyage," as they call it. The fishing gear of the trawler has also of late years been much enlarged some; trawls have now a beam of 48 or 50 feet with a net about 78 feet in length. The cost of the modern trawler, with all its gear and canvas (about 1000 yards), is well on for £1600, and nearly all the boats are now wholly or partially insured in mutual offices. The working expenses of a trawler, exclusive of the wages paid, will not probably be less than £400 per annum. The money paid in wages differs in different vessels, and are regulated in various ways as in the case of "fleeting," and in "single boating,"

Mr. A. W. Ansell, in the very interesting paper on trawling which he contributed to one of the Conferences held in connection with the "Great International Fishery Exhibition," of 1883, tells us that the number of British deep-sea trawlers may be taken at 3000 (not including the steam carrying cutters), Yarmouth leading with 700, Hull and Grimsby next, making together about half the number, the rest being scattered around our coasts. If the capital invested be taken at £15,000,000 in floating and share property, it will not be over estimated. "The number of hands to man these vessels at five or six hands per ship," says Mr. Ansell, "makes from 15 to 18,000,—the latter is more like the number. To this we add 2000 who are out of berth by changing ships, we have then 20,000 hardy and experienced hands employed in deep-sea trawling, and who have no other calling or occupation. Some of these have families, and calculating two only in each ship to be married, with each a wife and four children, we have 30,000 more who are altogether dependant on the trawl for support. But as the trade cannot be carried on without assistance of shore labour, it gives employment to more than as many more, such as, packers, curers, labourers, watchmen, coopers, net makers, riggers, etc., and a vast number of other trades too numerous to mention."

My readers will now, from the perusal of this and the foregoing chapter on fishing with lines, be able to form a tolerable idea of what may be called the white fish fisheries, as also of the abounding fish wealth of the Great North Sea or German Ocean.

NATURAL HISTORY OF THE SALMON.

The opinions of former writers on the Par, Smolt, and Grilse, Controversies
—The Double Migration of Salmon—The Salmon Disease : *Saprolegnia*
Ferax.

So many books have been written about this beautiful and valuable animal that I do not require to occupy a very large portion of my work with either its natural or economic history; for of the two hundred and fifty kinds of fish which inhabit the rivers and seas of Britain, the salmon (*Salmo salar*) is the one about which we know more than any other, and chiefly for these reasons:—It is individually of greater value as property than any other fish; its large size better admits of observation than smaller members of the fish tribe; and, in consequence of its migratory instinct, we have access to it at those seasons of its life when to observe its habits is the certain road to information. And yet, with all these advantages, or rather in consequence of them, there has been a vast amount of controversy, oral and written, as to the birth, breeding, and growth of the salmon.

The correctly ascertained facts of salmon life—that is to say, the amount of positive information which we possess about its natural history—are anything but numerous, and the rather misty inferences which imaginative biographers in times past have drawn from actions of “fish of the salmon kind” have so confused those who possess real knowledge as almost to prevent them from making known what they do know. The salmon during the last sixty years has been accompanied from its cradle to its grave by never-ending controversy on every feature of its life and growth. The parent fish have been spied upon in their breeding beds, their eggs have been nursed into life under inspection, the infant salmon have been most zealously guarded during the preliminary stages of their growth; the par have been seen changing into smolts; the smolts have been escorted to the sea, and a watch has been set on the growth of the grilse, because the identification of the fish, as it was gaining form and substance, has been over and over again questioned. A par, it has been said, is not a young salmon; a par, it has also been asserted, never becomes a smolt; nor does a grilse, it has been maintained, ever grow into anything but a grilse; moreover, we were recently informed that

salmon do not spawn every year, and that these fish do not therefore annually visit the stream of their nativity, as some naturalists have taken for granted. In short the perplexities which surround the life of the salmon in its various stages of growth seem annually to grow more numerous, while the nonsense, of which these perplexities have from time to time formed the theme, becomes more and more eccentric and ill to bear as it becomes more and more apparent.

A brief summary, therefore, of what is known, as distinct from what is surmised, with regard to some of the more curious phases of salmon life and change, may not prove devoid of interest, seeing that the fish is of importance to the national commissariat, and therefore of considerable value, not to speak of the speculations to which it has given rise in the arena of natural history, or the active parliamentary and local legislation of which it has formed the subject, nor of the affection with which the salmon is regarded by the sportsman.

Harking back for a period of half a century, we find ourselves in the very thick of the *par* controversy. It was then beginning to dawn upon one or two thinking people that such an abundant fish as the salmon must have a numerous parentage endowed with a great power of multiplication ; "but where," it was asked, "are the young ones?" No one seemed to be concerned about them, no one indeed seemed able to identify them. Old observers were not at one period awanting who maintained that they knew, and had long known, the young of the salmon; but unfortunately there prevailed in the early part of the present century such a confusion of nomenclature, that what was in reality the same fish, *i.e.* the young or fry of the salmon, was everywhere differently distinguished. A dozen different names might be quoted, all of which have since resolved themselves into one—*par* ; and *par*, by many persons for many a long day, was held to signify a fish complete in itself ; an independent fish breeding and multiplying on its own account and which never changed : hence its name, *par*.

Although it would be too tedious to trace the various features of the *par* controversy, as the fight lasted for many years, and in some of its phases is not yet over ; it will, nevertheless, be interesting to note one or two of the opinions which were entertained with regard to the natural history of that fish. In the "*Salmonia*" of Sir Humphrey Davy, in its day, and even yet, a charming work on angling and the natural history of fishes as

known fifty years ago, the par is alluded to as being, in all probability, a hybrid, the offspring of a trout and a salmon, or of the sea trout and common river trout! Some curious ideas were propounded by Halieus, one of the characters introduced in the work in question, as that "the *only* difference between the par and common small trout is in the colours, and its possessing one or two spines more in the pectoral fin." Likewise: "The river and sea trout seem capable of changing permanently their places of residence; and sea trout appear often to become river trout." And again: "Pars are exceedingly numerous in those rivers where they are found, which are never separated from the sea by impossible falls; from which I think it possible that they are produced by a cross between sea and river trout."

In the light of the knowledge we now possess, these opinions, if enunciated to-day, would be laughed at. One of the first men who bore intelligent witness to the par being the young of the salmon was Mr. Scrope, the deer-stalker and salmon-fisher, and he was supported in his view by Sir David Brewster. Another notable person who became convinced that par were young salmon was James Hogg, the Ettrick Shepherd, who, having had his attention directed to the subject by Mr. Scrope, said, characteristically enough, "I will believe my ain een before a' the learned men o' Europe." He had seen the par, as the scales of the smolt were growing upon it, and no argument would convince him that he was not right in his assertion that he had "fund oot" the young salmon.

As I have had occasion to mention the opinions of James Hogg on the salmon question, I may be allowed to state here that the following amusing bit of dialogue on the habits of the salmon once took place between the Ettrick Shepherd and a friend:—

Shepherd—"I maintain that ilka saumon comes aye back again frae the sea till spawn in its ain water."

Friend—"Toots, toots, Jamie! hoo can it manage till do that! hoo, in the name o' wonder, can a fish, travelling up a turbid water frae the sea, know when it reaches the entrance to its birthplace, or that it has arrived at the tributary that was its cradle?"

Shepherd—"Man, the great wonder to me is no hoo the fish get back, but hoo they find their way to the sea first ava, seein' that the've never been there afore!"

Another very positive speaker on the par question was Sir

William Jardine, who at one time maintained that the par had no connection with the migratory salmon. "I have no hesitation," said that eminent naturalist, "in considering the par not only a distinct, but one of the best and most consistently marked species we have, and that it ought to remain in our system as the *Salmo samulus* of Ray," but Sir William lived long enough to be converted and to admit that the par was the young of the salmon (*Salmo salar*). If par are distinct fish, how comes it that the male is never at any time found with roe, although the female is often found with milt? And how comes it, was also asked, that par are only found in those rivers which are frequented by salmon, and that salmon are never found frequenting streams in which there are no par? These, and a multiplicity of similar questions only served to render the piscatorial combatants more eager each to support his own side; and still, to-day even, there are many obstinate people who, notwithstanding what has been demonstrated before their eyes, will not believe that par are young salmon.

Is it not wonderful that it was left to James Hogg, of all men, to "jump at the conclusion" of the par being the young of the salmon, when so many evidences of that being the fact were constantly being thrust before the eyes of better-trained men, for the Ettrick Shepherd had little learning and no science? In reading "*Salmonia*," we cannot but see that the discovery was at the mercy of such a man as Sir Humphrey Davy, in fact it was thrust upon him over and over again, but yet he went out of his way even to argue that the fish must of necessity be a hybrid! By-and-by, however, there came a new man on the scene who was equally certain with Hogg that par were young salmon. "The par is the young of the salmon, and I'll prove it," said Mr. Shaw, gamekeeper to the Duke of Buccleuch, at Drumlanrig; and he was as good as his word—he proved it; but, strangely enough, his proof was doubted and his conclusions scouted. First of all, he gathered the eggs of salmon from their natural spawning beds and saw them with his own eyes hatch into par. To that mode of procedure, it was replied, "You have proved nothing; the eggs you have hatched may, *must* have been, not salmon, but par eggs!" Shaw, knowing that he was right, was not to be put down. He caught salmon himself, deprived the female of her eggs, and the male of his milt; the result in due time—as he of course knew it must be—was a large crop of *pars*. As the eggs were hatched in a safe place under his own care, he was in good

time able to show conclusively that par were young salmon. But he did more than that ; he caught par in the river and kept them in confinement till they changed into smolts, that is, became scaled fish, which they were not before.

Mr. Shaw, who had always been a keen observer of the salmon in all its stages, long before he ventured to make a public profession of his faith, had thought out the problem, and, after many experiments conducted in private, he *felt* that he was right, and offered to show that his theory would stand practical demonstration, which it did. He was thoroughly successful in the end ; he showed not only that par became salmon, but also that salmon were the parents of par ; and all that he affirmed and accomplished was again accomplished and confirmed, many years after, at the Stormontfield salmon nursery, where par have been annually bred from the salmon in hundreds of thousands in a way open to all the world to witness. The absolute necessity for the greatest possible care being taken in conducting experiments having for their object the solution of knotty points of natural history has been often made manifest, and never more so than in the case of the investigations into the growth of *Salmo eriox* (the bull trout, a fish of the salmon kind) of the Tweed. This fish is four times more numerous in the Tweed than the true salmon, *Salmo salar* ; and the commissioners of the river, to solve a question as to whether the young fish locally known as "orange fins" become bull trout or not, placed a lot of them in a pond at Carham. Some persons were satisfied with the experiments, but there were not wanting those who thought them, if not a failure at least imperfect ; and now it is proposed to begin at the real beginning in such matters. The orange fins experimented upon having grown into bull trout, it is wanted to see, by careful experiment, if the spawn of the bull trout will in time grow into "orange fins."

After it was proved, and when most people had begun to believe that the plentiful par were really the young of the salmon, there arose a new controversy, which is scarcely even yet held to be settled, although what occurred at Stormontfield should be sufficiently convincing for all but those who are determined not to be convinced. As is known, the salmon passes a part of its lifetime in the sea, and in consequence of that fact a curious question arose, as soon as it was generally admitted that par became salmon, as to when the smolts (that is, the salmon in its second stage of growth) first visited the salt water. The par

being always, summer and winter, found in the streams, was one of the chief facts relied on to prove that, whether or not it was a distinct fish, it could not be the young of the salmon, because young salmon must at some time go down to the ravening waters, and it was held as an article of faith that par never visited the sea at any time. That contention was, of course, literally correct, because it has been proved by experiment that par cannot exist in salt water, and not till the smolt stage has been reached do these tiny samlets seek the sea. At what age, then, are the young salmon imbued with the instinct of migration to the great deep, so protected by their scaly armour that the salt water cannot harm them? It was a very long time before Mr. Shaw's pars assumed the scales of smolthood; he had fancied, or assumed as a matter of course, that the par would be able to migrate to the sea in a year or so from the time of their birth, but the experimenter was terribly staggered when he found a period of twenty months elapse without his fish evincing any desire to seek the sea, and he was still more horrified at finding that some of the specimens of par contained milt! The fates appeared to be altogether against him. It looked, at one time, as if his experiments would prove nothing that he was anxious to prove, and everything that would suit the books of his opponents. Time, however, revealed the truth, and, as is often the case, the truth was found to be stranger than any fiction that had ever been invented about the growth of the salmon.

Before, however, going any farther with what was said and done and alleged, and proved or wrangled over, forty or fifty years since, it will be as well to state at once what is now known and accepted, from what has been accomplished, and consequently proved, at the Stormontfield salmon nursery. At that institution for the breeding of salmon, which at length is about to be closed, the course of business used to be as follows: The pisciculturists go out upon the river in the course of the months of November, or early in December, and capture as many salmon as they can find; these fish must be ripe for spawning, in which case the eggs are exuded gently from the female fish into a shallow tub filled with water; the salmon, during the operation, being used as tenderly as possible, is, on the completion of this artificial spawning, at once restored to the river, and, in the majority of instances, seems to feel nothing the worse for what has been done. The male fish is similarly treated; the milt is exuded into the same vessel as the roe, and

the two substances are gently mixed. One milter, it may be stated, has been found sufficient for the eggs of two or three females; and it may likewise be stated here that the milt of a tiny par has served to quicken into life all the eggs of a full-grown salmon! After being rinsed in clean water, the eggs are laid down in boxes filled with gravel, over which flows a perpetual stream: they give no more trouble, and in about one hundred and thirty days, on the average, the shells begin to give up their fish. Let us take it for granted that a batch of eggs laid down about the end of November will be all hatched before the middle of April. The young fish will grow on for at least twelve months before any changes become observable, but in thirteen or fourteen months after their birth—and this is curious enough as a fact in the natural history of the salmon—one-half of the lot will have begun to assume the livery of migration, will have become scaled fish, in fact, and be ready to proceed to the sea!

The late Mr. Buist, when superintendent of the Tay salmon fisheries, told the writer that he was greatly surprised at only the half of the brood leaving, and still more that the other half remained another year in the ponds before they were ready to migrate. All previous theories were thus set at naught by what occurred—by the reality, that is. Mr. Shaw had formed a theory that young salmon remained as par for nearly a period of two years before nature clothed them with their armour of scales; whilst another practical person in the service of the Duke of Sutherland, Mr. Young of Invershin, had arrived at the conclusion, after much enquiry and observation, that par became smolts in a little over twelve months from the date of their birth: it thus came about that both of these gentlemen were, at any rate, partially correct. But the division of the brood of salmon into two shoals brought additional perplexity to all who took an interest in the question of the growth of this fine fish. The idea was at once ventilated that the division must be a sexual one, and that the males went off in one season, and the females followed in the next; but an examination of the fish soon showed that there was nothing in that idea, as those which went and those which remained were of both sexes in about equal numbers. No law has been discovered that explains this seeming anomaly, and we have no alternative but to accept the fact as it stands, and leave the explanation to follow. It must be kept in mind that the fish bred at Stormontfield are not forced to move out of the

pond at any particular season; they remain as long as they please, and are well fed during their stay with crumbs of boiled liver. As the experiments of artificial breeding have been going on at Stormontfield for about a quarter of a century, an enormous number of smolts have been bred there—and during the whole period there has been no change observed in the order of emigration: the half of any given brood only leaves when the fish are a little over one year old, the other moiety remaining in the ponds another year.

The salmon may be said to begin the battle of life when it has reached the dignity of a scaled fish. And on its way to the sea, and after it reaches the salt water, the battle is a fierce one, as the young salmon has to encounter, both on its way towards and in the sea, a horde of enemies. It has been calculated that, of salmon which breed naturally, not five per cent. of those which are born ever live to repeat the story of their birth. Of eggs deposited by the parent fish—and all fish are exceedingly fruitful—probably more than a half will escape the fructifying properties of the milt; and of the half which may be fructified fifty per cent. will be devoured by enemies; while of the fish that do come to life, a very large number will never reach the sea, but will fall a prey to pike and other animals, which are always on the look-out for a dainty meal. A pike was once taken in the river Teviot with seventy-eight fine young par in his stomach! If we may now take it for granted that we have seen the young salmon safely off to sea, we come to another series of perplexities regarding the period which the fish passes in the bosom of the ravening waters, what he feeds on while there, and how long he remains. Much evidence has been collected regarding these points of salmon life, but it is feared that some of the facts supposed to have been ascertained are not so reliable as they might have been—not from the want of *bona fides*, but simply from imperfect or uninstructed observation. It has been assumed by various writers on the natural history of the salmon that its growth is very rapid, and that it finds a rich store of nourishing food in “ocean’s wide domain.” The truth is, however, that when the salmon is in the sea we lose sight of it, and know nothing, or next to nothing about it; we know not whither it travels, or how it passes its time, nor what it eats. Its digestion must be rapid, because salmon caught in the sea have invariably, as far as our knowledge goes, an empty stomach. Here is a far-away fact bearing on this point of salmon life—out of ninety-eight thousand

Columbia River salmon examined at the cannery of Cook & Co., Clifton, Oregon, only three were found with traces of food in their stomach. The reporter to the "United States Fishery Commission" asserts that salmon do not eat anything while in fresh water; but as our anglers find the fish rising to the fly with great eagerness at certain seasons, it is obvious that they take food in the fresh-water streams of Great Britain and Ireland, although it is among the ascertained facts of salmon life that these fish lose flesh during their visits to the fresh water. Mr. Buist, to whom I have already referred, was careful in noting such points, and during three different seasons he was able to bring out the fact that salmon ascending the Tay, and which were caught at Newburgh and marked, had, when taken at a later date, fallen away very much in weight, although they had not then visited the spawning beds, but were at the time examined in one of the tributaries (the Islay) of the larger river.

A considerable proportion of the young fish bred at Stormontfield were marked in various ways before they made their exodus to the sea as smolts. At one time, when a controversy was being carried on as to the rapidity of salmon growth, and whether or not a grilse ultimately became a salmon, many young fish were caught and carefully marked, and upon being again caught the increase of weight was noted and the fish restored to the stream, in the hope that it might once more be taken, and so admit of still further observation. A number of the best authenticated cases of salmon growth, as denoted by means of marking the smolts may now be stated.

Of the smolts marked previous to leaving Stormontfield in the month of May 1855, many were recaptured after their return from the salt water within two months after their liberation, and it is important to note that a number amply sufficient to admit of a fair percentage being caught was marked. The mortality of salmon is, as has been already hinted, too considerable to admit of our believing in the recapture of as many as twenty fish out of one hundred that may have been marked; but, as more than two thousand fish were marked in one season at Stormontfield, indeed 1200 were marked in one day, we can quite believe in the return and capture of two per cent. of the number. About one smolt in every hundred that left the pond after the 24th of May was marked by the abscission of the second dorsal fin. By the 31st of July twenty-two of these marked smolts were captured on their return, their wounds being skinned over, and, in

some instances, covered by scales. As smolts, on departing from the ponds, the fish would hardly weigh more than an ounce and a half, some of them perhaps a little more; on their being taken within a period of two months, the first of those which were caught weighed from 5 to $5\frac{1}{2}$ lbs., and as time elapsed the weight increased to 7 and 8 lbs.; while a specimen captured on the 31st of July weighed no less than $9\frac{1}{2}$ lbs.! The taking of these fish and the weights they had attained rests on the best of evidence; so that the increase is proved to be quite as rapid as some practical men had asserted it would be.

The next question which presents itself is, if a young salmon be found to have grown to the extent of 7 lbs. in the space of two months, what weight will it have attained after the expiry of a year? Such a question cannot be answered off-hand, as it has never yet been determined how salmon "fill in their time." Some fishery economists say that a salmon comes and goes to the sea twice in the year; others maintain that the fish do not return from the sea till they have spent a year in the salt water; hence the amount of wonderment which took place, and the keen controversy that arose over the twenty-two marked salmon of Stormontfield. The moiety of the fish left in the pond in 1855 remained in the par stage till April of the following year, when they began to assume the migratory dress of the smolt; and from the 28th of April to the 24th of May they continued to leave the pond in greater or lesser numbers every day. It is calculated that about 120,000 young fish left the ponds in the year 1856. The experiments in the way of marking were continued: 1435 were marked in all; 300 with silver rings, and 1135 by the excision of a piece of the tail. None of the 300 fish marked by the insertion of the silver ring were ever reported as having been captured, the percentage marked was too small; but several of those marked with the tail cut were taken, one of which, captured on the 12th of July, weighed $3\frac{1}{2}$ lbs. If it were to be assumed that salmon increased at the rate of six pounds a-year, a fish of the weight of fifty pounds must be, at least, eight years old; and were any of the first-marked Stormontfield fish now living, they would be veritable monsters of the deep. Salmon seldom die a natural death, the hunt for them is too close to admit of that; while any ailment, even of the slightest kind, renders them less able to cope with their numerous enemies. Still, occasional salmon are met with

which have a very aged appearance, with "scarcely a tooth in their heads."

The perplexities of salmon growth have, during the last fifty years, been investigated by many earnest enquirers, and by none more diligently than the late Duke of Atholl, who took great interest in all that related to the natural growth of the salmon. The Duke's experiments were carefully conducted; every fish caught was weighed and ticketed before being allowed to resume its journey. As the result of such investigations, his Grace was able to state with authority that he had caught and marked salmon which, on being recaptured, were found to have increased seven pounds in weight during one visit to the sea—that is, within a period of six months. Mr. Young of Invershin, who had ample opportunities of making and recording observations of salmon growth, was likewise in the habit of marking young salmon on the occasion of their departure to the sea for the first time, and his experiments resulted in his believing that, as a rule, the fish were not absent for a longer period than three months, and that during that time they attained a weight of several pounds. The grilse controversy need not be further referred to than to say that there are still many persons who do not believe that a grilse becomes a salmon. Grilse is but a name representing salmon of a certain size, and it has been undoubtedly demonstrated that every grilse may become a salmon, if only it live long enough. Fish that have never spawned are called grilse, and grilse are salmon ranging from two or three, to six or eight pounds weight. It is not known for certain at what age a salmon begins to spawn. So far as known, the spawning season of all salmon is in the winter time, when the rivers are full of water and the fish quite able to reach with certainty their topmost tributaries. Very young salmon have been seen on the spawning redds—par even ! The writer tried to ascertain from Mr. Buist if any of the marked Stormontfield fish were in spawn as they returned from the sea in July, as recorded, but that question had not been ascertained, although it is undoubtedly the most curious of all the questions connected with salmon growth. It is obvious that we have something yet to learn of the natural history of the salmon.

It has been stated that salmon make two voyages in each year to the sea, and this is quite possible, as we may judge from data already given on this point; but sometimes the salmon, although it can swim with great rapidity, takes many weeks to accomplish its journey, because of the state of the river. If there be not

sufficient water to flood the course, the fish must remain in various pools till the state of the water admits of their proceeding on their journey either to or from the sea. The salmon, like all other fish, is faithful to its old haunts ; and it is known, in cases where more than one salmon-stream falls into the same firth, that the fish of one stream will not enter another, and where the stream has various tributaries suitable for breeding purposes, the fish breeding in a particular tributary invariably return to it.

With reference to the idea of a double visit to the salt water, are we not entitled to ask—particularly as we have the dates of marked fish for our guidance—what a salmon that is known to be only five weeks away on its sea visit does with itself the rest of the year ? A salmon, for instance, spawning about “the den of Airlie,” on the Isla, some way beyond Perth, has not to make a very long journey before it reaches the salt water, and travelling at a rapid rate would soon accomplish it ; but supposing the fish took thirty days for its passage there and back, and allowing a period of four weeks for spawning and rest, there are still many months of its annual life unaccounted for. It cannot remain in the river forty-seven weeks, because it would become so low in condition from the want of a proper supply of nourishing food that it would die ; and it is this fact that has led to the supposition of a double journey to the sea.

The Rev. Dugald Williamson, who wrote a pamphlet on this subject, entertains no doubt about the double journey. “Salmon migrate twice in the course of the year, and the instinct which drives them from the sea in summer impels them to the sea in spring. Let the vernal direction of the propensity be opposed, let a salmon be seized as it descends and confined in a fresh-water pond or lake, and what is its fate ? Before preparing to quit the river it had suffered severely in strength, bulk, and general health, and, imprisoned in an atmosphere which had become unwholesome, it soon begins to languish, and in the course of the season expires : the experiment has been tried, and the result is well known. This being an ascertained and unquestionable fact, is it a violent or unfair inference that a similar result obtains in the case of those salmon that are forced back, from whatever cause, to the sea, that the salt-water element is as fatal to the pregnant fish of autumn as the fresh-water element is to the spent fish in spring ? . . . If there is any truth in these conjectures, they suggest the most powerful reasons for *resisting* or *removing* obstructions in the estuary of a river.”

The riddle of this double migration of the salmon is likely still to puzzle us. It is said that the impelling force of the migratory instinct is, that the fish is preyed upon in the salt water by a species of crustaceous insect, which forces it to seek the fresh waters of its native river; again that while the fresh water destroys these sea-lice a parasite infests it in the river, thus necessitating its return to the sea. My own experience leads me to believe that salmon can exist in the fresh water for a considerable time, and suffer but little deterioration in weight, but they never, so far as I could ascertain, grow while in the fresh streams. It is a well known fact that parr cannot live in salt water. I have both tried the experiment myself and seen it tried by others; the parr invariably die when placed in contact with the sea-water.

Mr. William Brown, in his painstaking account of *The Natural History of the Salmon*, also bears his testimony on this part of the salmon question:—"Until the parr takes on the smolt scales, it shows no inclination to leave the fresh water. It cannot live in salt water. This fact was put to the test at the ponds, by placing some parrs in salt water—the water being brought fresh from the sea at Carnoustie; and immediately on being immersed in it the fish appeared distressed, the fins standing stiff out, the parr-marks becoming a brilliant ultramarine colour, and the belly and sides of a bright orange. The water was often renewed, but they all died, the last that died living nearly five hours. After being an hour in the salt water, they appeared very weak and unable to rise from the bottom of the vessel which contained them, the body of the fish swelling to a considerable extent. This change of colour in the fish could not be attributed to the colour of the vessel which held them, for on being taken out they still retained the same brilliant colours."

Most of the controversies relating to the growth of salmon may now be held as settled. It has been proved that the parr is the young of the salmon; the various changes which it undergoes during its growth have been ascertained, and the increase of bulk and weight which accrues in a given period is now pretty well understood. But we still require much information as to the "habits" of fish of the salmon kind.

While conversing with Mr. Marshall of Stormontfield, and comparing notes on some of the disputed points of salmon growth, we both came to the conclusion that the following dates, founded on the experiments conducted at Stormontfield, might be taken as marking the chief stages in the life of a salmon. An

egg deposited in the breeding-boxes in December 1869 yielded a fish in April 1870; that fish remained as a parr till a little later than the same period of 1871, when, being seized with its migratory instinct, and having upon it the protecting scales of the smolt, it departed from the pond into the river Tay on its way to the sea, having previously had conferred upon it a certain mark by which it could be known if recaptured on its return. It was recaptured as a grilse within less than three months of its departure (July), and weighed about four pounds. Being marked once more, it was again sent away to endure the dangers of the deep; and lo! was once more taken, this time a salmon of the goodly weight of ten pounds! But there comes in here the question if it was the same fish, for it is said that the smolt in some cases remains a whole winter in the sea, and therefore that the fish I have been alluding to was a smolt that had never come back as a grilse. I have a theory that half of the brood of smolts sent to sea do remain over the winter and come back as salmon, while the others come back almost immediately as grilse. It is possible, however, that any particular fish may lose its river for a season, and be in some other water for a time as a grilse, and then finding its birth-stream come once again to its "procreant cradle." The rapidity of salmon-growth, however, I consider to be undoubtedly proved.

The salmon disease, *Saprolegnia Ferax*, has of late years played sad havoc with the fish of some of our rivers; it has carried them off, or led to their being killed in tens of thousands, and although the epidemic is not of the time of writing (December 1884) so virulent as we seen it, it is still existent, and may at any time increase to an indefinite extent. As to what the disease is, or is not, I have just to sum up by repeating what all men who have inquired and studied have said—that the more it is investigated, the more mysterious it seems. The "fungus," I am satisfied, is ever present in most of our fresh waters, and when circumstances occur, it fixes on the fish with deadly effect. All sorts of river and loch fish are liable to become affected. With regard to a remedy, it has been pretty well determined that if the affected fish can be got away, in the earlier stages of the attack, to the salt water, a cure can be effected. This being now generally known, proprietors of salmon fisheries ought to be able to take hold of a remedial measure which seems so easy. And arguing upwards from the cure to the cause, we obviously arrive at but one conclusion, which of course is, that the disease lies in faulty

water ; and anglers and others who choose to study the subject might very soon give us such a diagnosis of the disease and predisposing causes, as would in time lead to the stamping out of the plague. Meantime, "runs" of an artificial kind might be constructed, to provide a quick mode of hurrying affected salmon to the sea. "To the sea, to the sea," should be the cry, for in the salt water undoubtedly lies the cure. By all means remove from the water and bury the dead fish, but I would say try and cure the others ; whilst there is life there is hope, and it is a calamity for sportsmen when thousands of fine fish have to be killed in a salmon river, not perhaps too well stocked with the "monarch of the brook."

SALMON FISHING.

PART I.

Great Value of Individual Salmon—Loss of Eggs and Young Fish—Competitive Fishing—Poaching—Decrease in the Size and Weight of Salmon.

LEAVING the salmon as an object of natural history, I shall now look at it as an article of commerce. The "breeches-pocket" view of the question some years ago became of considerable importance, in consequence of failing supplies; for the commerce carried on in this particular fish is very large; and although our salmon-fisheries are not nearly equal in value to the herring and white fisheries, still the individual salmon is our most tangible fish, and brings its owner a large sum of money. Indeed of late years this "monarch of the brook" has become emphatically the rich man's fish; its price for table purposes, at certain seasons of the year, being only compatible with a large income; and liberty to ply one's rod on a salmon river is a privilege paid for in Scotland at a high figure per annum. Such facts at once elevate *Salmo salar* to the highest regions of luxury: certainly, salmon can no longer find a place on the tables of the poor; for we shall never again hear of its selling at twopence per pound weight, or of farm servants and apprentices bargaining not to be compelled to eat it oftener than twice a week.

At every stage of its career the salmon is surrounded by enemies. At the very moment of spawning, the female is watched by a horde of devourers, who instinctively flock to the breeding-grounds in order to feast on the ova. The hungry pike, the lethargic perch, the greedy trout, the very salmon itself, are lying in wait, all agape for the palatable roe, and eagerly swallowing whatever quantity the current carries down. Then the water-fowl greedily pounces on the precious deposit the moment it has been forsaken by the fish; and if it escape being gobbled up by such cormorants, the spawn may be washed away by a flood, or the position of the bed may be altered, and the ova be destroyed perhaps for want of water. As an instance of the loss incidental to salmon-spawning in the natural way, I may just mention that a whiting of about three-quarters of a pound weight has been taken in the Tay with three hundred impregnated salmon ova in

its stomach ! If this fish had been allowed to dine and breakfast at this rate during the whole of the spawning season it would have been difficult to estimate the loss sustained by his voracity. No sooner do the eggs ripen, and the young fish come to life, than they are exposed, in their defenceless state, to be preyed upon by all the enemies already enumerated ; while as parr, they have been taken out of our streams in such quantities as to be available for the purpose of pig-feeding and as manure.

Some economists estimate that only one egg out of every thousand ever becomes a full-grown salmon. Mr. Thomas Tod Stoddart calculated that one hundred and fifty millions of salmon ova are annually deposited in the river Tay ; of which only fifty millions, or one-third, come to life and attain the parr stage, that twenty millions of these parrs in time become smolts, and that their number is ultimately diminished to 100,000 ; of which 70,000 are caught, the other 30,000 being left for breeding purposes. Sir Humphrey Davy calculates that if a salmon produce 17,000 roe, only 800 of these will arrive at maturity. It is well, therefore, that the female fish yields about 1000 eggs for each pound of her weight ; for a lesser degree of fecundity, keeping in view the enormous waste of life indicated by these figures, would long since—especially taking into account the destructive modes of fishing that used a few years ago to be in use—have resulted in the utter extinction of this valuable fish.

The increased value of all kinds of fish food during late years has engendered a degree of avarice that leads to the capture and sale of almost everything that bears the shape of fish. The tenant of a salmon-fishery has but one desire, and that is to earn his rent and get as much profit as he can. To achieve this end he takes all the fish that come to his net, no matter of what size they may be. It is not his interest to let a single one escape, because if he did so his neighbor above or below him on the water would in all probability capture it. As a general rule, the tenant has no care for future years, and has no personal interest in stocking the upper waters with breeding fish. He is forced by the competition of his rivals to do all he can in the way of slaughter ; and were there not a legal pause of so many hours in the course of the week, and a close-time of so many days in the year, it is questionable if a score of fish would make their way past the engines devoted to their capture. A watcher can stand on the bridge of Perth, and at certain seasons signal or count every fish that passes in the

water below him, and every fish passing can be caught by those on the look out ; and I have seen the same watch kept on the Rhine,* and on other salmon rivers.

This unhealthy competition will always continue till some new system be adopted, such as converting each river into a joint-stock property, when the united interests of the proprietors, both upper and lower, would be considered. The trade in fresh salmon, which at one time nearly culminated in the extermination of the fish in some rivers, dates from the time of Mr. Dempster's discovery of packing in ice. Half-a-century ago, when we had no railways, and when even *fast* coaches were too slow for the transmission of sea-produce, the markets were exceedingly local. Then salmon was so very cheap as to be thought of no value as food, and was only looked upon by the population with an eye of good-humoured toleration—nobody ever expected to hear of it as a luxury at ten shillings a pound weight. No Parisian market existed then for foul fish, and fifty years ago people only poached for amusement. But in the excessive poaching which now goes on during close-time we have a minor cause nearly as productive of evil as the primary and legal one ; for of course it is *legal* for the tacksman of the station to kill all the fish he can. Add to these causes the extraordinary quantities of infant fish which are annually killed, coupled with that phase of stupidity which leads to the capture of grilse (salmon that have never spawned), and we obtain a rough idea of the progress of destruction as it goes on in our salmon rivers. Then there is poaching. Fifty or sixty years ago men caught a salmon or shot a pheasant for mere sport, or at most for the supply of an individual want. Now poaching is a trade or business entered into as a means of securing a weekly or annual income ; it has its complex machinery—its nets, guns, and other implements. There are men who earn large wages at this illicit work, who take to "the birds" in autumn and "the fish" in winter with the utmost regularity ; and there are middle-men and others who encourage them and aid them in disposing of the stolen goods.

Poaching goes on all the year round, especially on the Tweed,

* The Rhine is an excellent salmon stream, and yields a large number of fish. The five fishing stations at Rotterdam are very productive, each of them yielding about 40,000 salmon per annum ; and it would not be extravagant to estimate the produce of each of these fisheries as of the value of £25,000 per annum.

where for two hundred years and more, families are known to have been hereditary poachers, claiming to have as much right to the fish as the proprietors of the water themselves. It would require all the king's horses and all the king's men to prevent the Tweed poachers from getting "a fish," and even then, the poacher would prevail. Some persons fish single-handed, in certain cases families join in the work—on occasion, sons, father, and grandfather will be found on the long winter evenings engaged in the business, and in the course of a night or two sweep fish from off the spawning-beds which are totally unfit for human food. There is a ready market always to be found even for spawning fish. Few of my readers can have any idea of the immense number of salmon which are destroyed by this cause, and at the very time when they are at their greatest value, intent on the propagation of their kind. Indeed, on the very spawning-bed itself the "deadly leister" is hurled with unerring aim and mighty force; and the slain fish, safely hidden in the poacher's bag. A party will start at nightfall, and dividing into two companies, sweep the Tweed with a net from shore to shore, and capture everything of the salmon kind that comes within reach. The takes upon such occasions average from ten to forty fish. The first night upon which my informant—a weaver—went out, the result was seventeen large fish, three of which weighed ninety pounds. Upon the second occasion the take was much larger, thirty-eight salmon of a smaller size being the reward of their iniquity, weighing in the aggregate four hundred and forty pounds, and producing in cash £8 sterling, divided among eleven people. These stolen fish pass through numerous hands. A person comes at a given time and takes away the spoil; all that the actual poacher obtains as his share is a few pence per pound weight. They are bought from the thieves by middlemen, who again dispose of them to certain salesmen—each party, of course, obtaining a profit.

Speaking of salmon and salmon poaching, it may be asserted, I think, without fear of contradiction, that there has been more trouble experienced on the river sides from the misdeeds of poachers than in the pheasant preserves, or even on the grouse moors. The trade in foul salmon, which for so many years was carried on both in England and Scotland, was a disgrace to all concerned. For a poacher to steal a good clean salmon is bad enough, but to capture these fine fish in the very act of spawning is much worse. A salmon, valuable at all times, is never more

so than when in the act of repeating the story of its birth. To kill at that critical season an animal just about to deposit fifteen or twenty thousand eggs on a spawning bed, imperils our future salmon supply to an extent that cannot easily be measured. The destruction of salmon eggs and young salmon by forces of nature over which man exercise little control is sufficiently enormous, without the devices of the poacher. In the days when foul salmon were most marketable the chief outlet for the filthy commodity was to be found in Paris, where, in the course of years, tons upon tons of it was converted by the skilful cooks of that city into a palatable commodity. None but persons who have had personal opportunities of becoming acquainted with the facts and figures of the capture, are able to estimate the evil which was done to the fisheries in the spawning season by the ruthless slaughter of the breeding fish during close time. I was told by a Tweedside poacher that to take twenty or thirty big salmon in a night was looked upon as "poor sport." These fish, I am speaking of a period which embraced from the year 1852 to 1865, were chiefly sold to English buyers, some of them were boiled and disposed of as potted salmon, but the majority found their way to the Continent.

The Tweed commissioners of to-day have still, as has been indicated, a determined band of poachers to deal with. To be convicted of salmon poaching is not thought any disgrace on Tweedside ; no matter how large the fine may be, twenty people will readily give contributions towards its payment. During the long winter evenings little bands of daring adventurers used to sweep the "redds" with only too fatal effect ; and whole villages would be living on salmon, such as it was, for weeks at a time ; and even now many a "fish," as the poachers call a salmon, clean or foul, is made to contribute to the commissariat of the peasantry, while in my father's early days on Tweedside, every ploughman or weaver near the river or any of its important tributary streams had his winter stock of pickled salmon. In some of the border villages the women have been known to go out occasionally to aid in the harrying of the waters. "Yellow Bell" was an adept at the sport ; she was more daring than her husband on the water, and, Delilah like, could entice the bailiff on duty to take strong ale at a distant place while her male friends were engaged in spoliating the river. Many stories might be related of salmon poaching under difficulties ; of border frays and terrible encounters with the water watchers, but they

are all of the same kind, and must end in the confession that even now, with a wide-awake body of river police educated up to all the tricks of the business, the poacher all over the border has often enough the best of it. One great feat of "Yellow Bell" is still a sore point on Tweedside. Under the pretence that she was assisting a daughter engaged in domestic service to "flit," *i.e.* to remove to a new situation, she obtained the assistance of a Tweed bailiff to hurl on a wheelbarrow a heavy trunk to the railway station; that trunk contained eleven beautiful salmon packed in ice, which ultimately found their way to Newcastle-upon-Tyne. This incident always reminds me of an Edinburgh story, in which a thief taker in search of a stolen hundred-pound note was made by a clever woman to carry about in his hand the stolen treasure as he searched the house, the bank-note having been wrapped round the end of a tallow candle inserted in a ginger-beer bottle.

In former times, as at present, there were more ways of killing a salmon than by angling it. Parties used to be made up for the purpose of "burning the water," a practice which prevailed largely on the Tweed, as also on some of the north country salmon streams, and which afforded good rough sport. The burning took place a little after sunset, when an old boat was commissioned for the purpose, and flaming torches of pinewood were lighted to lure the fish to their destruction. The leister, a sharp iron fork, was used on these occasions with deadly power; rude mirth and song were usually the order of the night; and the practice being illegal was not without a spice of danger, or at least the chance of a ducking. Burning the water, it must, however, be confessed, was more a picturesque way of poaching than a means of adding legitimately to the produce of the fisheries as a branch of commerce. It would have been well for the salmon-fisheries had the arts of poaching never extended beyond the rude practice here alluded to; but now poaching, as I have hinted, has become a business, and countless thousands of the fish are swept off the breeding-beds and sold to dealers. Legislation on the salmon question has of late been greatly extended, some powerful Acts of Parliament having been passed for the better regulation of the various British salmon-fisheries, and it is satisfactory to think that much good has been achieved in consequence.

It is recorded that at one time great hauls of salmon could be taken either in the rivers of Scotland or Ireland, and that in England salmon were also quite plentiful. One miraculous

draught is mentioned as having been taking out of the river Thurso, on which occasion the enormous number of two thousand five hundred fish were captured. The discovery that fish packed in ice would carry a long way without decaying, led, as was to be expected, to so large a trade in fresh salmon between Scotland and England, that it at once effected a great rise in the price of the fish. High prices had their usual consequence with the producer. Every device was put in requisition to catch fish for London and the continent ; and if this was the case at the beginning, it will be readily understood how rapidly the fish-trade rose in importance as new modes of transit became common. At one time there was famous salmon in the Thames, and hopes are entertained of fish being successfully cultivated in that river. It is certain that much deleterious matter has been allowed to get into that stream, and also into that famous salmon river the Severn ; and in the rivers of Cornwall I believe the hope of breeding salmon is faint in consequence of the poisonous matters which flow from the mines. Many rivers which contained salmon in abundance in the golden age of the fisheries are now less prolific, from matter by which they are polluted, such as the refuse of gasworks, paper-mills, etc.

Stake and bag nets in Scotland are known to have been very destructive, as have the putchers, butts, and trumpets of the English and Welsh rivers. It would be tedious to describe the different fixed engines invented for the capture of salmon ; what I desire to show is that they injured the fisheries. A striking example of the effect of bag-nets occurred with regard to the Tay. The system having been at one time extended to that river, the productiveness of the upper portions of the stream was very speedily affected ; and shortly after their removal, the fisheries became greatly more productive.

At the date of the first publication of this work the size and weight of salmon were diminishing, and, as some fishermen thought, their condition and flavour also ; but during late years there has been seen a change for the better, and our salmon are growing in size again, so that we shall soon find fish as large as those of the olden time, notably the fish mentioned by Yarrell, which was exhibited by Mr. Groves, and weighed eighty-three pounds ; or that alluded to by Pennant, which was only ten pounds lighter. It is within the memory of anglers that fish of forty-five pounds weight were by no means rare in the Scottish

rivers: that salmon of thirty pounds, and thirty-five pounds weight were quite common; and that the general run of fish were in the aggregate many pounds heavier than those of ten or twelve years ago. Mr. Anderson, at one time lessee of the best salmon fisheries on the Firth of Forth, a gentleman who is master of his business, is of opinion that the average weight of fish was reduced at the time indicated to about sixteen pounds; and by the Tweed Tables of the period, the average weight of those killed, though apparently on the increase, in no month exceeded fifteen pounds. I asked, in the first edition of this work, "How is it, then, that we have no giants of the river, in these days?" The answer, I think, is simple and convincing. "Let us suppose, for example, that the fish grows at the rate of five pounds per annum: it would, therefore, take ten years to achieve a growth of fifty pounds. Now it is needless to say that, in British waters at any rate, we seldom either see or hear of a fish of that weight. The fact is, we do not give our salmon time to grow to that size. The greater portion of the fish that we kill are two years old, or at the most three—fish running from eight pounds to sixteen pounds in weight. It is clear that, if we go on for a year or two longer at the rate of slaughter we have been indulging of late years, there will speedily not be even a three-year-old fish to pull out of the water. It is very suggestive of the state of the salmon-fisheries that we have now eaten down to our three-year-olds."

Happily recent wise legislation on behalf of the fisheries has checked a great number of the evils which prevailed at the time indicated; the salmon is again increasing in weight, and the fisheries have once more become comparatively prosperous. During the last eight or ten years—1875-1884—many big salmon have been captured, two or three weighing more than fifty pounds have been taken in each year, and in the shops of our principal merchants there may daily be seen from the middle of February to the end of August, dozens of fish, *salmo salar*, ranging in weight from ten to thirty-four lbs., nor are forty pounders at all a rare sight. As to the average weight of the salmon of the period,—taking grilse into the count and accepting the annual take by the Loch Tay Anglers as a fair criterion of size,—it may be set down, I think, as being, at least, twenty lbs.

A fertile source of salmon destruction is the killing of grilse; the grilse being a virgin fish, its slaughter is just analogous to the

killing of lambs, without due regulation as to quantity. In this respect, "the conduct of salmon proprietors is as rational, as high-farming with the help of tile-drains, liquid manure, and steam-power, would be for the purpose of eating corn in the blade." As many as 100,000 grilse have been taken from one river in a year—a notable example of killing the goose for its golden egg. If we had an Act of Parliament to prevent the capture of grilse, we would then have more salmon. The parr and smolt are protected. Why? Because they are the young of the salmon. Well, are not grilse the young of the salmon also?

Various debates in the House of Commons on the English and Scottish Salmon Fisheries Bills brought out very distinctly the worst phase of the salmon question—viz. : the prevalence of stake and bag nets. These machines exercised a baneful influence on the fisheries, and in numerous instances intercepted about one-half of the salmon of particular rivers, before they could reach their own waters. These nets are erected in the tideways, not far from the shore, and as the fish are coasting along towards their own particular spawning-ground, they are intercepted either in the chambers of the bag-net, or in the meshes of the stake-net. It being held that fish taken in the tidal estuaries are in better condition than those caught in the fresh-water division of the large salmon rivers, they are of course in greater demand, and bring a slightly better price. There is, as we have already noted—but the fact needs iteration—no consideration among tacksmen of river fishings for the preservation of the fish; it seems to be a rule with these gentlemen to kill all they can. It is obvious that, if the upper-water proprietors were to act in the same spirit, and kill all salmon which reached the breeding-grounds, that fine fish, not unaptly called the "venison of the waters," would very speedily become extinct.

SALMON FISHING.

PART II.

Chief Salmon Streams—The River Tay Fisheries, their Rental and Working—Salmon Fishing in Holland.

As may be known to most of my readers, the chief British salmon streams, so far at least as productiveness is concerned, are the Tay, the Spey, the Tweed, and the Esk. I have not space in which to describe each of these rivers, but I desire, on behalf of English readers particularly, to say a few words about the Tay and the Spey.

The Tay drains an area of 2250 square miles, and it discharges, after a run of about 150 miles, a greater volume of water than any other Scottish river. "As ascertained by Dr. Anderson, the quantity which is carried forward per second opposite the city of Perth, averages no less than 3640 cubic feet." The main river and its affluents, and *their* varied tributaries, afford splendid breeding-ground for salmon. As an instance take Loch Earn. It flows from Loch Earn in the far west of Perthshire, and is, when it leaves the Lake, a considerable river, and over the greater part of its course its current is very rapid. A slight drawback to its capabilities as a fish-breeding river is the fact of its sometimes overflowing its banks; but its tributaries afford plenty of excellent ground for salmon-breeding. Indeed, in all its tributaries the Tay contains ample accommodation for fish. I have in my mind's eye some excellent salmon-beds near Airlie Castle, on the Isla. The banks of the river are overhung by foliage, and salmon sport industriously in deep pools, resorting to the gravel at the proper season in order to dig beds in which to deposit their eggs, and when in due time these are vivified and grow from the fry to the parr state, I have seen the youthful "natives" catching them in scores.

The Tay deserves special honour, for it must rank as the king of Scottish rivers, receiving as it does the tribute of so many streams, and running its course through such a variety of fine scenery. Loch Tay is generally accounted the source of this

river, but if it be considered that the loch is chiefly fed by the river Dochart, the source of this latter stream is actually the fountain-head of the Tay. The Dochart rises in the extreme west of Perthshire, and, after striking the base of the "mighty Ben More" and the Dochart hills, falls into Loch Tay at the village of Killin, before reaching which place it assumes the dimensions of a considerable river. There is fine angling to be had in the vicinity of Killin; indeed, the salmon rod-fisheries there are of some value, and trout can be taken in great plenty both in the Dochart and the Lochay. Loch Tay contains abundance of fish, and, as that sheet of water is of considerable size, there is ample room to ply the angle, either for salmon, trout, or charr. A few local inquiries as to angling on the Tay will elicit more valuable information than I can give here. At some places on the lower portion of the water the aid of a boat (a Tay boat) is necessary, as the best pools are otherwise inaccessible to the angler. The cost of a boat and man is about eight shillings, and on most parts of the river two men are required for attendance. Some parts of the Tay are quite free to anglers, especially about Kinfauns; and, if I mistake not, at other places as well. Perth forms a capital centre for the angler: it is a good place in which to obtain information or tackle, and it is easy to get away from the "Fair City" to places and streams of note. And if the angler wants to "harl" the Tay itself, Perth is the very best place to obtain instructions in the art of "harling," which is very attractive. The commercial fishings may be seen in operation at and below Perth: they are carried on by means of the net and coble. A boat sails out with the net, and taking a sweep of the water returns: in its progress enclosing any of the salmon kind that may be in that part of the river. The operation is usually repeated several times each day at every fishing station.

That the Tay is capable of breeding and feeding an immense number of salmon, has been well known for more than 400 years. We can, however, only guess the number of its fish, as no means exist of taking a census of the finny population of the stream. Various estimates have been formed from time to time of the quantity of salmon which might annually be taken from the river without impairing its powers of production. Persons who have been examined as witnesses have stated the annual produce of the Tay at 100,300 and 86,000 respectively of salmon and grilse, and if these may overhead be taken at the weight of 16lb., and

as being the season over of the wholesale value of 1s 3d per lb. weight, the sum represented on the average of the two numbers [93,150] would be, speaking roundly, 20s per fish, or £93,150 per annum. But such a sum cannot be maintained, judging from the rental of the river, as assessed for protection and other purposes. During the ten years ending with 1883, the figures of the rental have been as follows :

| | |
|----------------------|----------------------|
| £18,941 13 8 in 1874 | £21,697 14 0 in 1879 |
| 21,634 4 4 in 1875 | 22,518 8 7 in 1880 |
| 19,930 18 4 in 1876 | 19,579 11 5 in 1881 |
| 21,126 14 0 in 1877 | 19,221 11 7 in 1882 |
| 21,187 1 0 in 1878 | 17,773 0 0 in 1883 |

which we shall say, for the purpose of illustration, gives a mean rental of £20,000 per annum. Founding on that sum, and assuming, as has been done before, that to provide the rental, pay the expenditure incidental to the various fishing stations, the wear and tear of the machinery of capture, and the profit necessary to reward the lessees for use of capital and expenditure of time, a sum equal to triple that of the rental must be obtained by means of the fish captured, we arrive at the conclusion that 60,000 salmon and grilse, each of the value of one pound sterling, require to be taken from the river in the course of every fishing season. The weight per fish and the price suggested are within the mark, as it may be taken for granted that most of the grilse captured in the river Tay will weigh more than 5lb., whilst in some seasons many of the salmon which are captured will weigh not less than 35lb., fish ranging from 16lb. to 28lb. being quite common. On occasion very large salmon are caught in this river, one was recently taken [Dec. 1884] which it is thought would be 80 lbs., it was secured whilst the men were seeking fish to spawn for the hatcheries at Dupplin, its length was within half an inch of five feet, and its girth was twenty-nine inches. I once handled and measured a sixty pounder taken from the river Tay, its dimensions were as follows :—4 feet 3 inches long, 2 feet 8½ inches in girth, its circumference at the narrowest part of the tail was 11½ inches, and the breadth of the fan was 13 inches. Salmon of the respective weight of 58 and 64 lbs. had been taken in the Tay at one of Mr. Speedie's shots a few days before the 60lb. specimen which I measured. As to weight, the average of fish (salmon) taken by anglers on Loch Tay during the ten years from 1873 to the present time may be accepted as a criterion; these have, overhead, averaged a little more than 21lbs., and as to the price, it

is well known that salmon in the earlier periods of the fishery bring in London and other large cities very high figures, seldom less, from February to May, than half-a-crown per lb., and at times double that sum, whilst the price, even when the fish are most plentiful, seldom falls below 10d. per lb. Returns for various fine salmon consigned to London and other salesmen may be here quoted; *item*, a 61lb. fish which brought 1s. 9d. per lb. to its captor; *item*, a 63lb. salmon which realized at the rate of 3s. per lb., £9. 9s. the price of two or three sheep! It is interesting to know that all over the country, as well as in the river Tay, the average weight of salmon has lately increased.

Holding, then, that it is proved that the river Tay yields 60,000 fish per annum, each of the value of £1, let us now try to determine whether that is the maximum number of salmon for a stream of such dimensions, or whether it could be made to yield a still greater number. It is somewhat difficult, however, from the lack of statistics, to determine whether or not the Tay should carry more fish than it does at the present time—namely, the sixty thousand salmon and grilse above set down as being indicative of the rent and working expenses. When a river is overcrowded the fish lose in condition, and fall off in size and weight, whilst the contrary is the case when the proper number only are being bred and fed. Judging from the size and weight of the salmon captured, the Tay during these last eight or ten years—is just sufficiently well stocked, and no more. The year 1883 proved somewhat exceptional in its yield of salmon, but why it has done so we have not as yet been able to determine, nor will it be easy to find a reason for the increased takes of fish. Probably the supply is at all seasons just as abundant, although the fish are not at all times so accessible as they proved in 1883. It is, of course, impossible to count the fish of the river Tay; but it must be crowded with tens of thousands of salmon of all ages, from fry hatched in April and May to those monarchs of the stream which weigh from 35lb. to 55 lb., and which must be from six to ten years of age. The Stormontfield salmon-breeding experiments have now run their course, and are to be abandoned in favour of a new plan, which does not go much beyond the safe hatching of the eggs. Much more we think, was expected from Stormontfield than was really obtained. Half a million of young salmon were said to have been annually added to the population of the river by means of the Stormontfield plan of protected breeding, but if that number of fish was really placed in the Tay

every year, the fact has never become apparent in the magnitude of the rental. If, for instance, only a twentieth part of the number said to have been bred at Stormontfield (25,000 that is to say) had reached the status of table fish the rent should, since the beginning of these experiments, now some thirty years since, have risen to about £30,000 a year! Nature is a severe monitor, and man's devices to aid her, in order to his own aggrandisement, are often set at nought. She preserves a rigorous balance of animal life, and it is not improbable that the weight of fish caught in the Tay this year represents the utmost capability of the river as a salmon-producing stream.

It is thought that the salmon yield of the Tay might be largely increased if certain obstructions in the path of the salmon to new breeding ground were to be removed. The chief natural obstacle which salmon in search of spawning ground have to encounter is that caused by the Falls of Tummel not far from Pitlochry. If some means of getting salmon over these falls either by well-devised ladders or by blasting or otherwise levelling the obstacle could be hit upon an immense area of new salmon water would be rendered accessible to the fish—more than 100 miles of lake and stream, it has been calculated. Another stretch of water could be obtained by reducing the Falls of the Garry, or at all events by aiding the salmon to surmount the falls by an artificial erection of some sort. The fish seek of themselves to pass these natural barriers, and on rare occasions have “jumped” the Falls of Tummel, and they frequently succeed in passing up the Garry. There are no engineering difficulties in the way which could not be surmounted; the difficulty lies, we understand, in arranging with the proprietors as to the division of the spoil; and so in the meantime the fish are kept out of four fine lochs and lose a suitable series of spawning places. For a sum of about £2000, it is thought, an artificial pass suitable for the admission of the fish to the upper waters could be constructed, and the rent of the Tay be thereby increased by a sum of £1500 per annum. Propositions have more than once been made with the view of letting up the fish, and so increasing the breeding and feeding area of the stream, but each successive scheme has been abandoned, and at present the matter is in abeyance. Could not some plan be hit upon whereby the Laird of Faskally might be properly compensated for any concessions he might make in the matter, either by means of a sum of money to be paid down by the owners of the commercial fisheries, or by an annual rent charge

to be mutually agreed upon? It is quite clear from the abandonment of a recent proposed Tay fishery bill, that those interested will not be *forced* in this matter.

This difficulty regarding the Falls of Tummel introduces the most burning question of salmon fishery economy—namely, the rights of proprietors to the fish; in other words, the grievances of the upper proprietors, the men who provide for the fish their cradle and nursery in which to pass the first year or two of their lives. “Why,” it has been asked, “should we breed fish for you to capture and sell?” Four-fifths of the money derived from the salmon of the Tay is obtained by the owners of the net fisheries, leaving a fifth to represent the value which the upper proprietors derive from the river. It is no doubt hard enough that the men who may be said to sow the seed of the salmon harvest which the Tay annually produces should be left to glean what they can during the few weeks left for angling, which in some instances amounts to nothing at all, the fish in some seasons not reaching the far-away spawning grounds till it has become illegal to capture them. The remedy which has been more than once proposed for this anomalous state of matters is that the river should be converted, as regards the interests of the salmon lairds, into a joint-stock company, in which all should share on some equitable plan to be devised.

At present the fishing system is a thoroughly competitive one, the interest of each lessee being to prevent, if possible, the ascent of a single salmon to the water of his neighbour. There are 132 fishing stations on the Tay, these being divided as follows—namely 38 above the bridge of Perth, 49 between Perth and Newburgh, where are situated the more prolific fishings; while to these have to be added 45 stations or fisheries between Newburgh and the mouth of the river. These fisheries are worked by or from 178 “shots,” or nets: “The shots on the Tay”—we are quoting from information obligingly communicated to us by the intelligent superintendent—“average two for each station; one fishery is worked with four, but very few have more than three; and it may also be mentioned that, although the whole of the fisheries are not continuously worked, some of them being leased merely to keep away competition, and one or two shots are only netted on the Monday mornings, taking the chance of a fish having come up on the Sunday, yet a large number of persons are employed during the fishing season. Over 30 men are engaged on one station, while employment in fishing on the

Tay will probably be given to some 850 persons, chiefly in the working of the various 'shots,' and as the fishing continues for some six months, a sum of about £16,000 will require to be expended in wages." Were the river to be worked on some general scheme for the benefit of all, it is scarcely too much to say that two-thirds of the sum paid for wages could be saved. The Tay could be fished quite as effectually as it is at present from some 10 or 12 shots instead of the 178 just enumerated. Moreover, no more than an agreed upon number of fish need be captured, so that there would be no fear of there being at any time a scarcity of breeding salmon, whilst the rights of the upper proprietors to a share in the spoils of the season should be recognized. By the competitive mode of fishing under which the ascending salmon have to run the gauntlet of all the stations, it is somewhat wonderful that a single fish is permitted to reach the breeding grounds. It is only, perhaps, because of the weekly cessation of fishing that the breeding stock is kept up. At present a large number of the fishing stations are let from season to season by public roup. In the system of management now indicated such modes of letting the stations would not require to be resorted to; and speaking in the interest of the proprietary, fishing need only be carried on whilst there was a good demand for the fish; in abnormal times of plenty nothing need be done.

A movement in the direction indicated is, we understand, contemplated. It has been proposed to obtain a private Act of Parliament to enable a committee of Tay proprietors to lease all the nets under a given compact, which provides for the owners being paid a rent equal to that of an average take of the three previous seasons—good security being given for the implementing of all conditions. By this agreement it is proposed to cease fishing by nets at the stations above the old bridge of Perth, as also to lease all the town fishings from bridge to harbour, as well as the stake nets on the sea coast, more especially those on the north side of the Tay; also to acquire the cruives on the river Earn, and keep the checks always open. The proposal now alluded to provides for an alteration of the netting season on the main stream and its tributaries, so as to begin fishing on the 10th day of February and to terminate on the 27th day of August, instead of as at present opening on the 5th of February and closing on the 21st of August. This may turn out a matter of not the least importance—it simply means to begin fishing a few

days later and continue a few days longer, which in some seasons may mean the difference between a good year's fishing and a bad year's fishing. As a rule, I am adverse to meddling with the recognised "seasons," but it must be kept in mind that the persons who wish the change are dealing with their own property, and if injury should result they will themselves be the sufferers. Should the fisheries of the river ever come to be arranged in the mode indicated, such matters of detail will be easy of adjustment, as in prosperous years fishing may terminate well within the date asked for.

The river Spey is an excellent salmon producing stream, in fact, taking size into account, it is probably the richest salmon fishery in Scotland. The Spey runs about a hundred and twenty miles before it falls into the sea, and some parts of the river are very picturesque.

"Dipple, Dundurcus, Dandaleith, and Dalvey
Are the bonniest haughs on the run of the Spey."

The stream is very rapid, having in its course a fall of twelve hundred feet; it rushes on in one continuous gallop from its mountain well to the sea, giving rise to the local proverb of there being "no standing water in Spey," although there are pools thirty feet deep. Still, as a rule, the river is shallow, having generally a depth of about three feet; and there are places which, when the water is a little low, may be crossed by a man on foot.

I have seen rafts of wood coming down from the hills at the rate of ten miles an hour; and the Spey is not only the most rapid, but also the widest of our large Scottish rivers. "The cause of this is easily explained. The river drains thirteen hundred miles of mountains, many of whose bases are more than a thousand feet above the level of the sea. The Dulnain, draining the southern part of the Monagh-Lee Mountains, runs more than forty miles before entering Spey; and the Avon, with a course as long, brings down the waters of Glenavon, which lies between the most majestic mountains in Britain. Besides these great tributaries, the Spey has the Truim, the Tromie, the Feshie, the Fiddoch, and other affluents, swelling her volume with the rapidly-descending waters of a mountainous country." The river Spey is an example of a well-managed stream, producing a very handsome revenue. It is well managed, because the Duke of Richmond fishes it himself; and, of course, it is his

interest to have it well protected, and to keep a proper stock of breeding fish. On the Spey, however, there is no confusion of upper and lower proprietors to fight against and take umbrage at each other, the river belonging mostly to one proprietor.

Other Scottish rivers yield, or did at one time yield, large annual sums in the shape of rental; and on the larger salmon rivers of Scotland the income derived by many of the "lairds" from salmon-shots forms a very welcome addition to their land revenues. Mr. Johnstone, the lessee of the Esk fisheries at Montrose, stated at a public meeting held in Edinburgh to protest against the removal of stake-nets that he estimated the rent of the Duke of Sutherland's fisheries at £6000 a year, and quoted his own rents as £4000 per annum, giving him the privilege to fish on two different rivers, on one of which he had eight miles of water on the other side.

Good rentals accrue from the salmon rivers of Scotland. The Tweed at one time was worth about £20,000 per annum to its proprietary; the yearly rent at present is about £13,000. From 1879 to the present time an immense number of salmon in this river have fallen victims to "the disease," probably not less than 30,000 in all, or a number about equal in value to two years' rent.

The condition of the Scottish salmon rivers is now annually reported by Mr. Archd. Young, who is familiar with the subject, and whose official position as an officer of the Scottish Fishery Board enables him to speak with authority on the subject of our salmon fisheries.

The foregoing account of the River Tay and its fisheries may very fitly be supplemented by the following description of a fishery for salmon that I visited in the course of a tour in Holland, which was made with the view of adding to my store of fishing knowledge.

Having been told that Dutch salmon was excellent, large in size, and delicious in flavour, and knowing that a considerable quantity of such fish is annually sent to London—indeed Rhine salmon are now sold in Edinburgh and Glasgow in December,—I felt anxious during a visit to the Netherlands to obtain reliable information about the Dutch salmon fisheries. The Rhine having many mouths in Holland, I expected to see salmon everywhere in that country, and to find it cheap, but in that I was disappointed. There can be no doubt that the mighty father of waters contains in his liquid bosom a great army of

fish. The fish breeding and feeding grounds of a river which has a course of nine hundred miles, and which is supplemented, on its way to the sea, by hundreds of minor streams, must be numerous and productive, but for all that I was told that Rhine salmon were not so plentiful in Holland as they had once been. No wonder. A salmon river and its tributaries, to be thoroughly economised, requires, like the Duke of Richmond's Spey, to be under the management of one person, or at any rate to be subject to some one set of laws. But for the Rhine such an arrangement is obviously impossible, or at least at the time of my visit was not practical. A fish may be bred in some far away tributary, and after passing through the territory of the King of Prussia, may be captured in Holland! Although salmon are comparatively scarce in Holland, I was told the old story of its having been once so plentiful that apprentices used to bargain against eating it oftener than twice a week! Now, I daresay they never see it except on rare holiday occasions, it being quite as dear in Holland as in London, averaging about 1s. 8d. per pound, and from all I can learn never likely to be much cheaper under present circumstances,—1s. 4d. per pound weight being about the price at which salmon is sold to the dealers. The fish is, of course, dearer when bought retail.

Salmon fisheries in Holland appear to be well managed, so far as capturing the fish is concerned, some of them being fished very systematically. I paid a visit to one on the Maas, a few miles above Rotterdam, and easily accessible by means of the steamer to Dordrecht. It is worked by a company of gentlemen in Rotterdam, who rent it from Mr. Van Briennan, and it is situated on a terrace on the right bank of the river—that is, it is worked from the terrace, which is fitted up for the purpose. Except during the fence months, which the company are careful to observe, the fishing is worked night and day, the nets being tugged out from the upper end of the terrace by means of a small steamboat, which, sweeping down the river for about a mile, lands the fish at a stage constructed for the purpose, when they are at once carried in a hand net to a large floating iron tank, pierced with the necessary holes for permitting a full supply of water, there to be kept alive till they are required for market. Buyers from Rotterdam and elsewhere come to a plateau on the opposite side of the river, and hold a market every morning. The fish are then killed by the fishers, and carried across to the selling place, where they are sold at so much per fish, the persons

buying being quite able to discern the weight and quality of each salmon by looking at it. I was not present at any of the sales, but I was told that they were "Dutch auctions," there being always a few persons to compete.

This salmon fishery, so far as I could judge from a visit of a few hours, is remarkably well conducted; the capture of the fish goes on continuously, so that about thirty hauls of the nets are obtained every twenty-four hours—there being a cessation from labour at the flow of the tide. A considerable number of salmon are taken at this fishery, as many as seventy have been frequently caught in a day (and night)—a common take being fifty or sixty. During the time of my visit, twelve hauls of the net were made by hand—the steamer being under repair—with a result of eighteen fish: on that day the total capture was sixty-six fish, which produced a sum of £69 15s., being a little over one pound sterling per fish; and as the average weight of the Maas salmon is fifteen pounds, the sum I have named gives 1s. 4d. per pound weight as the price. Upwards of thirty men and half a dozen boys, in addition to an overseer, are employed at this fishery on the Maas, and their wages average about 18s. a week each. These men live in a bothy, and only go home on the Saturdays. None of the persons employed are allowed to drink spirituous liquors, but a plan to provide food for them at a general table was not successful; they now mess individually or in groups at their bothy as best suits them. The superintendent has a pleasant house to live in, and about double the wages of the men under him. The Company weave and dye their own nets in the winter time. Each set of nets is 2000 feet in length, and 33 feet deep, and at the Van Briennan fishery three sets of nets are kept constantly at work night and day, as I have already stated. When the steamboat engaged in this fishery is disabled, as happened to be the case during my visit, horses are called into requisition, in order to wind in the nets by means of a very powerful wheel windlass. The fishing is by law suspended from November till February, and also during every flow of the tide. An act of parliament regulates the size of the mesh, and prohibits the use of all fixed nets. The Dutch people won't allow the Maas to be called a branch of the Rhine, or their fish to be called Rhine salmon, which the superintendent of the Van Briennan fishery said were inferior fish, but in this he is evidently wrong. The total quantity of salmon taken from the waters of Holland and

from the lower Rhine is, of course, very large, great quantities of them being sent to Paris, Brussels, London, Edinburgh, and other populous places. The Scottish people, and they are good judges, do not like the Dutch salmon so well as their own fine curded fish ; those taken in the estuaries of Holland are too oily and rich, while those taken a few hundred miles up the Rhine are rather lean and flavourless to suit the epicures of Scotland.

SALMON FISHING.

PART III.

Guesses at Salmon Production—The Tyne *versus* the Severn—Difference in the Laws of Fishing in Scotland and England—Rentals of Salmon Fisheries—Disease in Salmon—Hindrances to Salmon Propagation.

No authentic statistics are collected of the total weight of salmon coming to market, or of the sums which are annually derived by individuals or associations, in name of rent, from salmon waters ; but although no official statements are published of the annual capture of salmon or of the rentals of rivers, sufficient evidence is at hand of a more or less reliable kind, by means of which it is possible to arrive at a tolerably fair estimate of the salmon wealth of the three kingdoms. Even taking the quantities which in the course of a season pass through our chief piscatorial bourse as a basis, it is quite possible to form by such means a good idea of the national power of salmon production, as also, generally, to gauge the state of our various fisheries year by year, for Billingsgate may aptly enough be termed the fish thermometer of the United Kingdom, the daily supplies sent to that great piscine mart being a constant although fluctuating percentage of the varied fish captured in British waters. Thus in the year 1874 over 2,000 tons of salmon were consigned to Billingsgate for distribution, the greatest amount of weight being represented by Scottish fish, salmon from Scotland being sent every season to London in large quantities : consignments to Billingsgate from the Irish fisheries are second in importance, Irish salmon, as a rule, being forwarded direct to their places of consumption, chiefly English manufacturing towns ; Birmingham, Manchester, and Bradford being good customers to the salmon fisheries of the Emerald Isle. It will probably come in the nature of a surprise to many persons to learn that the salmon fisheries of Ireland yield a larger revenue than those of Scotland. Selecting a year at random, we find from the report of the Inspectors of Irish Fisheries that in 1877 over 47,000 boxes of salmon, each containing 150 lbs. of fish, were exported from Ireland to England.

The salmon consumption of the Irish or the weight of fish sent direct from Irish fisheries to Glasgow and other parts of

Scotland, can only be guessed ; but, judging from the statistics given by the inspectors of the quantities of salmon carried by the local railways, the salmon consumed annually by the Irish people must be considerable. It is probably within the mark to say that the value of the salmon caught in Ireland is much more than the value of what is taken in England and Scotland added together. The annual value of the salmon captured in the three kingdoms has been estimated by Mr. Young and others at £750,000, divided as follows : England £100,000, Ireland £400,000 Scotland £250,000. In 1878 the Irish fishery inspectors valued the salmon despatched to England only at £418,476 11s. 3d. For the year 1883, the estimated value of Irish salmon sent to England was £443,782.

It has been more than once suggested in the course of controversy that Government should purchase the rights of salmon fishing throughout the three kingdoms. Computing the value as above—which, however, includes the cost of capture and the interest on fishing plant, or, in other words, the difference between rental paid and prices realized—and taking the money question only into account, discarding entirely, let us say, any claims for loss of amenity, it will be apparent that a large sum would be required for such a purpose.

The failure of England to play a distinguished part in the supply of salmon, considering the number and magnitude of its streams—and the late Mr. Buckland in his report for 1878, which is a representative one, gives a *catalogue raisonnée* of 129 rivers that might all be populous with these fish—is altogether remarkable. The Severn alone, with its vast area of water and numerous affluents, it is but reasonable to conclude, ought to produce as many and as heavy salmon as the Tay and Tweed and their numerous tributaries united ; but, as a matter of fact, the Severn, once famed at least for the quality of its fish, yields but a very scanty supply. As for the river Thames, which at one time enjoyed considerable reputation as a salmon stream, and has been talked of again and again by enthusiastic fishery economists as a future home of the “ venison of the waters,” it is too much of a highway for steamboats, and an easy passage for sewage, ever again to become a productive salmon river. “ Of late years not a salmon has been seen.”

As can be gleaned from the annual reports of the inspectors poaching prevails very extensively on all the English rivers in which there is salmon ; unfortunately, there are very few. Of

late some of the rivers have, we believe, been harried by organized gangs, who, setting the authorities at defiance, have openly taken and sold the fish. The effect of such wholesale spoliation on rivers which only produce salmon in tens, instead of, as in Scotland, by hundreds must in time result in the total extinction of our finest fish. It requires a very populous river indeed to withstand the raids of the poacher, and the run upon it of the natural enemies of the salmon as well. Nature keeps up a severe balance, the ova of all fish are devoured in the hatching season by a number of enemies, whilst the young salmon have to pay tribute to the greedy pike and other piscine foes at all stages of their growth. When man, in the guise of a poacher, constitutes himself a factor in the account and robs the waters of their breeding fish, especially those rivers in which the salmon are scarce, it is no wonder that fish disappear and streams become barren. Fishery inspectors, for the sake of the good work they are trying so hard to achieve, deserve the greatest possible encouragement. I am not one of those economists however, who expect a miracle to be worked; I shall not venture to say we shall ever obtain, far less within four or five years, as some enthusiasts hope, one million of choice salmon from our English streams and estuaries; less will serve us, and if the present supply even could be doubled, we would then look upon the future with greater hopes of success. Even to double the supply of salmon at present obtained from English rivers will involve several years of hard and continuous inspection. It is proverbial that what is reputed to be everybody's business is nobody's business, and with so many varied rights and interests to be reconciled, it will never be an easy task to render an English salmon river very productive, it is not too much to assert, however, that a much better rental could be derived from the salmon fisheries of some of the English rivers than from the mill races which in many instances retard the ascent of the spawning fish to their natural breeding-grounds. The value of a salmon fishery depends chiefly, or indeed altogether, on the breeding streams to which the fish can obtain access, because nothing is more certain than that, if there are no proper breeding tributaries, there cannot be a large supply of salmon. Speaking generally, and with a knowledge that much good work of the kind has been done by the inspectors, I must counsel a still greater hewing down of the obstacles which hinder the ascent of salmon to the upper waters.

It is noteworthy that the source of the chief supply of these fish

in England has been the "coaly Tyne." In the report of the inspectors for 1878, the statistics of the capture from 1870 to 1878 inclusive, are given, which for the purpose of comparing with the capture on the river Severn for the same period, I have computed at their money value, assuming each fish to be of the average weight of 12 lbs., and to bring 1s. 3d. per lb. The numbers taken in the Tyne in the years 1870 to 1878 inclusive, were as follows: 1870, 36,450; 1871, 120,600; 1872, 129,100; 1873, 86,792; 1874, 21,746; 1875, 23,290; 1876, 24,840; 1877, 41,300; 1878, 48,150. The numbers taken in the Severn are not given in the report, only the values are stated, and the figures of the two rivers, assuming the fact of prices being the same, are here placed side by side for comparison.

| <i>Year.</i> | <i>Tyne.</i> | | | | <i>Severn.</i> |
|------------------|--------------|-----|-----|---------|----------------|
| 1870 | ... | ... | ... | £27,337 | £13,000 |
| 1871 | ... | ... | ... | 90,450 | 11,200 |
| 1872 | ... | ... | ... | 96,825 | 8,000 |
| 1873 | ... | ... | ... | 65,094 | 10,000 |
| 1874 | ... | ... | ... | 16,309 | 10,500 |
| 1875 | ... | ... | ... | 17,467 | 10,590 |
| 1876 | ... | ... | ... | 18,630 | 14,560 |
| 1877 | ... | ... | ... | 30,975 | 12,888 |
| 1878 | — | ... | ... | 36,112 | 8,978 |
| Totals, £399,199 | | | | £99,708 | |

being an average of £44,355 per annum for the Tyne, and of £11,078 for the Severn. These figures being sufficiently eloquent of themselves, require no commentary.

It will be well to explain here, that there is a difference in the laws of England and Scotland as to the rights and practice of fishing.

This difference may be very well described in the words of Mr. Young, who is an advocate at the Scottish Bar, and also an inspector of Scotch salmon fisheries. He says—"There is no such thing as a public right of salmon fishing known to the laws of Scotland; and all the salmon fishings in the country, not only in rivers, but also in estuaries and in the narrow seas, to at least one mile seaward from low water mark, belong either to the Crown or the grantees of the Crown. Riparian ownership by itself confers no title to salmon fishings—not even to rod fishing; and it sometimes happens that one

person possesses the land on both sides of a river and the subjacent soil, whilst another has the right to the salmon fishings. A charter with an express grant of salmon fishings is required to constitute a valid right, or a charter with a general grant of fishings, followed by forty years' prescription of salmon fishings, or a Barony title, fortified by a similar prescription."

As is obvious from this extract, salmon in Scotland may be called "property" fish, which persons are not entitled to capture as a matter of course. Salmon in a given river, or part of a river, are as much the property of the owner or lessee of that portion of water (as a rule dependent on the grant of a right of fishing to the superior) as the oxen grazing on a farm. Some salmon streams in Scotland, possess a rather extensive proprietary, as the Tay and Tweed; others, again, are as nearly as possible the property of one person. The river Spey, for instance, with perhaps the exception of one fishery, is the property of the Duke of Richmond and Gordon, and the portion of which his Grace is not himself the owner he very shrewdly leases, so that he obtains command of the whole water, and as has previously been stated, is thus enabled to work it, as regards the fishing, pretty much as he pleases; and if we are not mistaken his Grace still keeps the fisheries in his own hands. The Duke of Sutherland is another nobleman who is able to do as he pleases in the matter of his salmon fisheries.

In most questions connected with the economy of our salmon fisheries, or the natural history of the salmon, Scotland must be awarded the place of honour. As has already been related, the chief battles connected with the growth and distinguishing features of the fish have been fought in Scotland, notably the "par question." Another war waged in connection with the Scottish salmon rivers is of equal importance, namely, the establishment of a weekly and annual close time, to enable the fish to make at certain times an unmolested ascent from the sea to their spawning beds. The salmon are not molested for a period of twenty-four hours in each week, and for several months of autumn and in winter net-fishing entirely ceases; but these periods of grace were at various times the subject of much contention before they were arranged; and even now, when the value of a close time has been confirmed by the continued prosperity of the Scottish salmon fisheries, there are not wanting persons who would find an excuse for disturbing present arrangements.

The fishing stations of rivers in Scotland are usually let every

year by public auction, so that persons desirous of entering upon the business of salmon fishing have an opportunity of becoming tenants, the competition being open to all comers. Salmon-fishing as now pursued is therefore somewhat of a lottery. A man who offers £500 for a fishery has no certainty that he will capture a sufficient number of fish to pay rent and working expenses, and after doing so, leave himself a profit on the outlay of his capital and remuneration for his own enterprise and labour. And in years in which a great fishing occurs, the owner of the fishing obtains no higher rent than he has probably obtained in worse seasons—his rents are supposed to “average ;” but it is quite certain that salmon rents have a tendency to fall quicker in bad times than they rise when there ensues a run of good seasons. It may be said that the plan of letting the fishings openly by auction is sufficient to prevent monopoly and to ensure a fair rent, but that is not always the case. It would be better both for lairds and tenants if salmon fishery rentals were fixed on some other principle than that now in use ; if the owners of fisheries were paid, for instance, by a percentage of the sum derived from the sale of the salmon by the fish factors, it would be more equitable than the present plan. The market price of salmon is known to all who like to take the trouble to inquire during the season, and nothing could well be easier than to arrange for and obtain such a percentage of the receipts as would be fair between the contracting parties. The advantages of arranging salmon rental on this principle are too obvious to require argument ; in good years the owner of a fishery would obtain an increased rent : in bad years the tenant would not be asked to pay more than he had earned.

Referring to the observation I have made above, some lessees of Scottish salmon fisheries have of late begun to advocate as a remedy for bad seasons an alteration of the close time in so far as to suggest that ten days’ grace might be given on all rivers in which, from causes over which the lessees had no control, the fish could not make their run to the spawning grounds about the usual time. In the case, for example, of a bad catching season on the River Tay, lessees would like that net fishing should not close before the last day of August, instead of, as at present arranged, on the 20th of that month ; but in order to balance the close time the lessees would agree, were such a concession to be granted, that the borrowed days should be restored at the beginning of the following fishing season, which,

in the case of the Tay, would be timed to begin on the 15th instead of the 5th of February. This proposition, it is contended, would not be at all unreasonable, provided the proprietary of the river were unanimous, which, however, is exceedingly unlikely, seeing that the men who supply the breeding grounds and the men who own the commercial fisheries are usually, speaking in a figurative sense, at what may be called "daggers drawn" with each other.

As has been stated, Scottish salmon lairds, and lessees of fisheries as well, have during the past five years been rather alarmed by the outbreak of an epidemic disease in some of the Scottish salmon streams, just as the grouse lairds have been more than once terribly scared by "the grouse disease," and yet these birds, according to all accounts, were last season nearly as plentiful as ever they have been. A prolonged official inquiry was conducted into the causes of the malady which had affected the health of the salmon (*Saprolegnia Ferax*), and an elaborate report on the subject was recently issued. This document, however, is somewhat disappointing, inasmuch as it leaves the question of the salmon plague as nearly as possible where it was found by the commissioners; in other words, it fails to assign the disease to any definite cause, nor does it provide a remedy. The industry of the reporters (Messrs. Buckland, Walpole, and Young) in collecting evidence is sufficiently evident, and that the evidence is valuable as an exposition of what has taken place among the salmon stock of certain rivers no one will be found to deny. In summing up this report the commissioners remark that "increased observations by naturalists, microscopists, and other scientific persons, prolonged over many seasons, may possibly be necessary in order to enable us to arrive at a complete knowledge of the cause of the recent outbreak of *Saprolegnia*, and of the remedies which are applicable to this disease." In that I agree, although plenty of time has elapsed since this fungoid growth was first observed; indeed, it was strangely overlooked during the period of alarm which recently prevailed, that this disease is no new thing, but has been frequently observed in the Tweed and its tributaries at intervals during the last sixty years, and is very well known in connection with fish kept in aquaria, and to persons who have been in the habit of hatching fish eggs on the piscicultural plan. I shall not venture in these pages to set up any theory of my own on the present phase of the salmon disease, but that the pollution of the water

inhabited by affected fish has something to do with the spread of the fungus is more than probable. Pure water is an essential element in the health and increase of salmon, and it remains to be seen, as regards several Scottish salmon streams, whether or not the refuse of all kinds of manufactories is to continue to be drained into them, seeing that such matter might very likely be otherwise profitably utilized.

FURTHER FACTS AND FIGURES ILLUSTRATIVE OF OUR FISH WEALTH.

Fish supply of London—Statistics of the capture of soles—Brill and plaice—Turbot—Figures of the take of cod and haddock—Finnan Haddocks—Mackarel—Estimates of value of round fish caught—Probable value of our total fish stock as now in the sea.

IN case of our losing ourselves amid the figures I have given, it will before going farther be well to devote a few pages to the bringing to focus the annual catch of white fish. As has been already said no official statistics are taken of the numbers which are captured of our chief food fishes, but during late years, we have been presented with sufficient facts and figures to enable us to give something like a summary of the fishery work on the high seas. British fishermen have easy and free access to an enormous expanse of water, both off our immediate coasts and in the German Ocean, and the yearly take of white fish of all kinds should be commensurate to the space fished. And so it is. We have but to figure the population of London and the other populous cities and towns of England, Scotland, and Ireland, and consider that if half of the persons inhabiting them were to consume only six shillings worth of white fish every year, that amount of consumption for a population of 17,100,000 persons would represent a sum considerably over £5,000,000 sterling.

Although this may seem a rough-and-ready way of arriving at a conclusion as to our consumption of white fish—namely, cod, haddocks, soles, turbot, and whiting—so far as the total sum is concerned, it can be sustained by facts, or by inferences founded on facts. With regard to the fish supply of the great metropolis, it may be of some interest to mention, that in the years 1878, '79 and '80, an average of over 128,000 tons were delivered at Billingsgate Market; the weight delivered in the last of these years being 130,629 tons. During a recent visit to the great "piscatorial bourse" I was told that the weight of fish mentioned was being now exceeded, and, judging from the enormous business going on in all parts of the market at 6 a.m., it looked to be so. A great fact was mentioned to me in connection with the fish trade carried on at Billingsgate, it was that in the course

of seven years one firm alone had disposed of trawled fish of the value of a million and a quarter sterling! It has been given over and over again, as a rough estimate, that 500,000 tons of this excellent food material are annually consumed in the United Kingdom, and I believe these figures are not in the least exaggerated; but I prefer my own method of trying to arrive at the total consumption and capital value of our fish stock as contained in the great deen.

With regard to what is perhaps our most favourite food fish various statistics have occasionally been published. Mr. Couch, for instance, no mean authority on matters pertaining to the natural and economic history of British food fishes, tells us that in the early part of the present century 97,000,000 of soles were annually consumed in London! He says in "Fishes of the British Islands," p. 200, vol. iii, article *Sole*: "The large number of soles which are caught in the United Kingdom may be judged from the fact that the average amount of those which were yearly brought to the London market in the early part of the present century was ninety-seven *millions*, and those which were sold in the other parts of the kingdom must have been proportionally great." I rather suspect 'the other parts of the kingdom' would not in the early part of the century be well supplied either with the sole or any other sea fish, because of the difficulty of finding sufficiently quick modes of conveyance, and, therefore, I shall only allow 3,000,000 of these fine fish, in addition to Couch's estimate for London, for consumption in all other places, which gives us a total consumption of 100,000,000 of soles, which, if estimated over head for illustrative purposes at only threepence for each sole, would amount to £1,250,000 sterling. Yarrell's estimate of the consumption of soles in London some fifty years ago is more modest; he sets it down as being 86,000 bushels, and if we estimate the bushels as containing 60 soles, it still gives us a very large number, namely, 5,160,000, as being annually consumed in London, and that at the period indicated would be a likely enough figure. At the present time, with an army of 750 retail fishmongers, each with a shop, and twice as many fish-hawkers perambulating the streets of the vast city, the sale of soles must be very large—in all likelihood four times what was estimated or ascertained by Mr. Yarrell—whilst a proportionate quantity will be disposed of in other large cities and towns of the United Kingdom. Let us say, then, to be modest, that the consumption of soles all over the United Kingdom amounts to

40,000,000 soles per annum ; the sum realized, at the moderate rate of sixpence each, would represent £1,000,000 sterling. The number given is probably far within the mark, but I can only, of course, give "illustrative" figures and prices, as it is difficult to hit on exact numbers. The sums paid for capture vary in different places at different seasons, and the fish pass through so many hands on their way to the public stomach, all taking toll by the way, that neither wholesale nor retail prices can be "fixed up" with any degree of accuracy. Nor is it easy to obtain a knowledge of the sums paid for fish to the "toilers of the sea" who capture them.

Of flounders, brill and plaice, who shall dare to set down in plain figures the quantities which are every year placed at the credit of our national commissariat? Millions upon millions of plaice, annually give employment to the frying-pans of London! Investigation into the business and earnings of the London street folk revealed, about a quarter of a century ago, that these toothsome members of the flat-fish family were every year disposed of by the street vendors alone, in almost incredible numbers, not taking into account the quantities sold by retail fish-merchants, or the demands of Liverpool, Manchester, Birmingham, and other large centres of population; whilst the people of Scotland would doubtless partake largely of these fine fishes which are found in abundance in the friths and bays surrounding that part of Her Majesty's dominions.

It requires a visit to Grimsby, where is situated the wholesale fishmarket of the great North Sea, to find out the value of the aldermanic turbot. On the "Pontoon," at Great Grimsby harbour, I have at times seen a turbot yield about a sovereign and a half to those who caught it. Such a price for the chief member of the *Pleuronectidæ* is not uncommon when the weather is stormy, and the trawlers are averse to put out to the stormy fishing-grounds of the German Ocean. The "Antiquary," when he was bargaining for his "bannock fluke" (turbot), could never have foreseen that some day turbot would sell at three shillings a pound weight. Many a turbot of large size and good condition, fresh from the Firth of Forth, has before now been disposed of for a single shilling. There are hundreds of British trawlers constantly at work in the North Sea, adding day by day to the national commissariat, but statistics are not taken of the fish captured by these vessels, only the owners know how far the venture is profitable.

Turning once more to the informing pages of Yarrell, we find the annual consumption of turbot in London estimated by him at 87,953; that number, it is quite safe to say, in order to represent the consumption of to-day, would require to be doubled, and even then the total arrived at would probably be considerably short of the quantity consumed by the four million persons who inhabit the great world of London, not to speak of the many thousands of hungry strangers who daily find hospitality within its gates. If we multiply the number of turbot given by Yarrell by two, we should likewise require to multiply the price paid for turbot sixty years since by a similar figure; indeed, a turbot that half a century ago might be purchased for a crown, would to-day be thought cheap at a pound. Taking the turbot supply of London at 200,000 fish per annum, and allowing that an equal number are required throughout the other populous places of the three kingdoms, we arrive at a consumption of 400,000 of these fish, and estimating them all over as being of the value of 10s. each, it forms a sum of £200,000 of the total amount derived from our annual sea harvest. In this estimate the turbot which are brought to London by the Dutch are not included, I only count those which we capture in our own vessels. That this estimate of the turbot supply is studiously moderate will at once be obvious when it is calculated that there are at least 1200 boats constantly on the sea searching for these and other fish; and if we estimate that these vessels are at work only during 150 days of the year, and that they will capture at the rate of three turbot each per diem, such an amount of industry would yield 540,000 of these fish. Many other kinds of fish are, of course, taken in the trawl nets, but is only the best fish, such as turbot, soles, cod, &c., that are considered "prime;" plaice, flounders, haddocks, and commoner kinds, are known in trawl ships as "offal" and are of much less value. The proportions captured of each are on the average about three and a quarter of "offal" to three quarters of "prime."

Wonderfully large quantities of "round fish"—that is, cod, ling, whiting, and haddock—are captured every year for the use of the public, but these inhabitants of the sea have undoubtedly become scarce, so far as our shore fisheries are concerned, and fishermen have now to cast their lines at greater distances from home in order to ensure success. At certain times of the year very large supplies, upon some occasions indeed incredible numbers have rewarded the industry of the fishermen. Among

other duties the Scottish Board of White Fisheries collect certain statistics relating to the capture and drying of codfish, and for the year 1875 it is recorded that nearly seven millions of cod, ling, and hake were captured and cured in various ways. Quite as many of these fish would be taken by Scottish boats for sale in the open market from day to day as fresh fish, and at certain times the chief member of the *Gadida* family will fetch in a fish-monger's shop the handsome sum of one guinea; a great contrast to the prices which ruled a quarter of a century ago, when equally fine fish of the kind could be obtained for an eighth of the price; indeed, for 1s. 4d., many a prime cod, of large weight, after a little higgling has been transferred from the brawny shoulders of a Newhaven fish-wife to the cook of an Edinburgh citizen. If we could sum up the number of round fish which are annually drawn from the liquid bosom of the great deep, the draughts would undoubtedly savour of the miraculous. An occasional glance at the windows of our fish-merchants' shops will sometimes reveal as many as a couple of hundred haddocks waiting to be sold, while, hid from the vulgar gaze in underground cellars, there may be as many more.

The latest statistics of the Scottish cod and ling fishery, those namely for 1883, published by the Fishery Board of Scotland, give the take of these fish so far as cured, as being 3,620,207 individuals, a very large proportion of the number, 1,617,262 having been caught off the Shetland Isles; for these cured fish, Ireland, which ought to supply its own fishery wants from its own waters, is a profitable customer buying 36,666 cwts. In addition to the cod and ling captured to be cured, fresh fish of the same kind were taken and sold for a sum of £97,297. That amount at the rate of 2s. each, would represent 972,970 fish. It is curious to know that some years ago, the stock of cod, ling, and hake, in the Scottish seas, was estimated at 70,000,000 of individual fish.

There are not less altogether than three thousand sail of trawlers and cod vessels fishing throughout the year in the German Ocean and on our own immediate coasts, and these capture an enormous weight of fish: many of the trawlers and cod smacks are known to earn about £700 per annum. Allowing that every one of the three thousand vessels which we believe to be actively engaged in the fishery earns only £400 a year, that would amount to a sum of £1,200,000 for fish taken in the North Sea, by English boats; and if we allowed a similar sum to represent

the value of the white fish taken by the boats fishing nearer home in the firths and bays of the three kingdoms, we should even then be within the mark in estimating the value of the white fish taken by the boats of the United Kingdom at two and a half millions sterling. At Great Grimsby a constant supply of living codfish is kept ready in the harbour in perforated boxes for the exigencies of the market. On some days there will be as many as 16,000 of these fish waiting for customers, each box containing from thirty to eighty fish according to size. A "cod banger," after an absence of eight or ten days at the live fishery, will return with a cargo of probably 400 living and 200 dead fish packed in ice; taking these, living and dead, as being each of the value of 2s. 6d., it represents a sum of £75 as the product of the voyage; voyages are not alike productive, and sometimes a few weeks will elapse between the return from one voyage and the entering upon another. To ascertain the number of codfish which are annually captured is very difficult, but it may be estimated, at 25,000,000 per annum, and these I am inclined to value at, say, to be well within the mark, the illustrative price of two shillings each, which gives us a sum of two and a half millions sterling.

A recent inquiry, conducted by the writer, into the trade in our smaller round fish, led him to believe that the enormous number of 100,000,000 haddocks and whittings are annually brought to market; and that of haddocks and the smaller-sized codfish *cured* as "Finnans" or "Eyemouths," there would be as many as 25,000,000. There is no exaggeration in this statement: 250,000 pounds weight of these fish, "Eyemouths," have been landed in the space of forty days at a fishing-place in Berwickshire, and we have but to take stock of our provision shops to see the positively wonderful number of haddocks which are exposed for sale to be convinced that the above estimate is well within the mark. In the cities of Glasgow, Aberdeen, Dundee, and Edinburgh, for instance, these smoked haddocks are sold in more than two thousand shops, and if each of these shops sell only one "bunch" every day, (a bunch consists of three fish), it would represent a sale in the course of a year, say, of three hundred days, of 1,800,000 in these four cities! These statistics, obtained by personal investigation, are cited in order to afford those who doubt the means of making a calculation for themselves, informing them at the same time that, packed in barrels, vast numbers of these smoked fish find a ready

market in "great London town," as well as in Liverpool, and in other populous places of England. The 100,000,000 millions of Haddocks may certainly be set down as being of the value of threepence each, which would represent a sum of a million and a quarter sterling !

Millions of mackarel are sold in the course of the year ! One cannot visit a fish merchant's shop from about the middle of March to the end of August, without seeing scores of these fish on the counters. They are now sold all over the kingdom every day while they are in season, and what is of some importance mackarel are beginning to frequent places where they were not formerly captured. Of late years, this fish has been taken off the Scottish coasts in considerable numbers, and now sells largely throughout Scotland. The Irish mackarel fishery has been already alluded to at page 104, where the capture of nearly 30 millions of these fish is chronicled ! But the take of mackarel on the English and Scottish coasts during the season must largely exceed anything done in Ireland, but I am not in a position to give even a good guess at the total number, it cannot be less I think than three times the number captured in the Irish seas, say 90 millions, and taking the fish all over, they may be averaged I think at 20 ounces each, so that the weight of the number given represents a most important contribution to the national food commissariat—thousands of tons indeed. As to price, it is difficult to hit an average, boat loads some days barely realise a farthing per fish, but just by way of hitting off a figure let us say that 120,000,000 of mackarel are annually caught and are sold at first hand at a halfpenny each, that gives us a sum of £250,000, which must, according to the results of the Irish fishery, be very largely within the mark, but it is better to be well within than far outside of the mark. No good purpose can be served by exaggeration, besides my "illustrative" figures may serve as a sort of foundation for more accurate calculations. I take it then that the section of our sea harvest to which these figures appertain, will afford us the following totals :—flat fish of all kinds £2,250,000 ; cod, ling, haddock, mackarel, etc., £4,000,000, to which may be added a further sum of about half a million sterling for fish not enumerated, such as eels, mullet, skate, and other denizens of the deep, exclusive, of course, of the herring family.

Who can number the inhabitants of the great deep ? Who can tell with any degree of accuracy how many fish may be left

in the sea after man has taken his yearly tribute, and after those vicious monsters which prey upon them have been fed? The figures I have given, errors excepted, represent the value only of the fish captured by man—the capital stock which is still left to multiply and replenish must be enormous, a gigantic mass, an incalculable number, on which for years and years to come man may make his daily draughts with impunity. I have shown as I have progressed in my narrative how productive our fishes are, how fruitful nature has made them, and yet certain kinds at certain places are becoming less plentiful than formerly, showing that the craft of man is having its effect and that despite powers of reproduction in hundreds of thousands and millions, the sea might in time cease to contain a single fish. Let us suppose for an instant that creation in the ravening waters was suddenly to cease how long would the fish then on hand last, at present rates of consumption? Not longer probably than five or six years, for the stock, prodigious as it undoubtedly must be, would go down with great rapidity, I certainly should feel reluctant under such circumstances to give more for it than a sum equal to four or at the utmost five years' purchase of the annual capture.

ANGLERS' FISHES.

Fresh-Water Fish not of much value—The Angler and his Equipment—Pleasures of the Country in May—Anglers' Fishes—Trout, Pike, Perch, and Carp—Gipsy Anglers—Angling Localities—Gold Fish—The River Scenery of England—The Thames—Thames Anglers.

ALTHOUGH it may be deemed necessary in a work like the present to devote some space to the subject, I do not set much store by the common anglers' fishes, so far, at least, as their food value is concerned ; for although we were to cultivate them to their highest pitch, and by means of artificial spawning multiply them exceedingly, they would never (the salmon, of course, excepted) form an article of any great commercial value in this beef-eating country. In France, where the Church enjoins many fasts and strict sumptuary laws, the people require, in the inland districts especially, to have recourse to the meanest produce of the rivers in order to carry out the injunctions of their priests. The smallest streams are therefore assiduously cultivated in many continental countries ; but the fresh-water fishes of the British Islands have only at present a very slight commercial value, as they are not captured, either individually or in the aggregate, for the purposes of commerce ; but to persons fond of angling they afford sport and healthful recreation, whether they are pursued in the large English or Scottish lakes, or caught in the small rivulets that feed our great salmon streams.

Although Britain is possessed of a seaboard of 4000 miles, and a large number of fine rivers and lakes, the total number of British fishes is comparatively small (about 250 only), and the varieties which live in the fresh water are therefore very limited ; those that afford sport may be numbered with ease on our ten fingers. Fishers who live in the vicinity of large cities are obliged in consequence to content themselves with the realisation of that old proverb which tells them that small fish are better than no fish at all ; hence there is a race of anglers who are contented to sit all day in a punt on the Thames, happy when evening arrives to find their patience rewarded with a fisher's dozen of stupid gudgeons. But in the north, on the lakes of

Cumberland or on the Highland lochs of Scotland, such tame sport would be laughed at. Are there not charr in the Derwent and splendid trout in Loch Awe? and these require to be pursued with a zeal, and involve an amount of labour, not understood by anglers who punt for gudgeon or who haunt the East India Docks for perch, or the angler who only knows the usual run of Thames fish—barbel, roach, dace, and gudgeon. To kill a sixteen-pound salmon on a Welsh or Highland stream is to be named a knight among anglers; indeed, there are men who never lift a rod except to kill a salmon; such, however, are giants among their fellows.

For sport there is no fish like the “monarch of the brook,” and great anglers will not waste time on any fish less noble. An angler, with a moderate-sized fish of the salmon kind at the end of his line, will not feel that he is in the enjoyment of a sinecure, but he would not for any reward allow his work to be done by deputy. I have seen a gentleman play a fish for four hours rather than yield his rod to the attendant gillie, who could have landed the fish in half-an-hour's time. It is a thrilling moment to find that, for the first time, one has hooked a salmon, and the event produces a nervousness that certainly does not tend to the speedy landing of the fish. The first idea, naturally enough is to haul our scaly friend out of the water by sheer force; but this plan has speedily to be abandoned, for the fish, making an astonished dash, rushes away up stream in fine style, taking out no end of “rope;” then when once it obtains a bite of its bridle away it descends sulkily into some rocky hiding-place. In a brief time it comes out again with renewed vigour, determined as it would seem to try your mettle; and so it dashes about till you become so fatigued as not to care whether you land it or not. It is impossible to say how long an angler may have to “play” a salmon or a large grilse; but if it sinks itself to the bottom of a deep pool, it may be a business of hours to get it safe into the landing net, if the fish be not altogether lost, as in its exertions to escape it may so chafe the line as to cause it to snap, and thus regain its liberty; and during the progress of the battle the angler, if fishing from the land, has certainly to wade, aye and be pulled once or twice through the stream, so that he comes in for a thorough drenching, and may, as many have to do, go home on some occasions after a hard day's work without being rewarded by the capture of a single fish.

There is abundance of good salmon-angling to be had at the

proper season in the north of Scotland, where there are always a great variety of fishings to let at prices suitable for all pockets ; and there is nothing better either for health or recreation than a day on a salmon stream. There are one or two places on Tweed frequented by anglers who take "a fishing" as a sort of joint-stock company, and who, when they are not angling, talk politics, make poetry, bandy polite chaff, and generally "go in," as they say, for any amount of amusement. These societies are of course very select, and not easily accessible to strangers, being of the nature of a club. The plan which every angler ought to adopt on going to a strange water is to place himself under the guidance of some shrewd native of the place, who will show him all the best pools and aid him with his advice as to what flies he ought to use, and give him many useful hints on other points as well. Anglers, however, must divide their attention, for it is quite as interesting (not to speak of convenience) for some men to spend a day on the Thames killing barbel or roach as it is to others to kill a ten-pound salmon on the Tweed or the Spey. It is good sport also to troll for pike in the Loddon or to capture grayling in beautiful Dovedale. And so pleasant has of late years become the sport, that it is now quite a common sight to see a gentle-born lady handling a salmon-rod with much vigour on some of our picturesque Highland or border streams. In fact, angling is a recreation that can be made to suit all classes, from the child with his stick and crooked pin, to the gentleman with his well-mounted rod and elaborate tackle, who hies away in his yacht to the fiords of Norway in search of salmon that weigh from twenty to forty pounds, and require half a day to capture.

Without pretending to rival the hundred and one guides to angling that now flood the market, I shall take a glance at a few of the more popular of the anglers' fishes ; not, however, in any scientific or other order of precedence, but beginning with the trout, seeing that the salmon has been amply discussed in a separate division of this work.

Of all our fresh-water fishes, the one that is most plentiful, and the one that is most worthy of notice by anglers, is the trout. It can be fished for with the simplest possible kind of rod in the most tiny stream, or be captured by elaborate apparatus on the great lochs of Scotland. There are so many varieties of it as to suit all tastes ; there are well-flavoured burn trout, not so large as a small herring, and there are lake giants that, when

placed in the scales, will pull down a twenty-pound weight. The usual run of river trout, however, are about four or six ounces in weight; a pound trout is an excellent reward for the patient angler. Where a trouting stream flows through a rich and fertile district of country, with abundant drainage, the trout are usually well-conditioned, large, and of good flavour; but when the country through which the stream flows is poor and rocky, with no drains carrying in food to enrich the stream, the fish are, as a matter of course, lanky and flavourless; they may be numerous, but they will be of small size. It is curious, too, to note the difference of the fish of the same stream: some of the trout taken in Tweed, and in other rivers as well, are sharp in their colour, have fine fat plump thick shoulders, great depth of belly, and beautiful pink flesh of excellent flavour. The flavour of trout is of course dependent on the quality and abundance of its food; those are best which exist on ground-feeding, living upon worms and such fresh-water crustaceans as are within reach. Fly-taking fish—those which indulge in “the feed” of ephemera that takes place a few times every day—are comparatively poor in flesh and weak in flavour. As to where fishers should resort, must be left to themselves. I was once beguiled to fish a river called the Dipple, but it is a hungry sort of water, where the trout on the average only weigh about three ounces, and are scarce enough; although I must say that for a few minutes, when “the feed” was on the water, there was an enormous display of fish, but they preferred to remain in their native stream, a tributary, I think, of the Clyde. The mountain streams and lochs of Scotland, or the placid and picturesque lakes of Cumberland and Westmoreland, are the paradise of anglers.

For trout-fishing I would name Scotland as being before all other countries. “What,” it has been asked, “is a Scottish stream without its trout?” Doubtless, if a river has no trout it is without one of its greatest charms, and it is pleasant to record that, except in the neighbourhood of large seats of population, trout are plentiful in Scotland. It is true the railway, and other modes of conveyance, have carried of late years a perfect army of anglers into its most picturesque nooks and corners, and therefore fish are not quite so abundant as they were fifty years since, in the old coaching days, when it was possible to fill a washing-tub in the space of half-an-hour with lovely half-pound trout from a few pools on a burn near Moffat. But there are still plenty of trout; indeed there are noted Scotch fishers who can fill baskets

from streams near large cities that have been very much fished. The trout is a thoroughly "game" fish, and where of any size takes a rare lot of catching in reality. I say in reality, because so many fanciful fishing stories now get printed, depicting the prowess of anglers and the battles they have to fight, that readers are apt to be misled. Successful angling "on paper" comes so easy to some writers on the subject, that they never fail, whenever a chance occurs, to magnify their efforts on the water. Such men are quite able to spin a very long yarn about the capture of a trout, the taking of which did not perhaps occupy five minutes; but these yarns are not the fault of the poor trout. I have known men who scarcely knew how to handle a fishing-rod, who, "on paper," spend a busy three-quarters of an hour capturing a trout. All they did in reality was to cast their fly on the water, which they did awkwardly, and after pulling the line about for a time or two, more by good luck than any skill they had, they managed to hook their poor little fish and then pull it to land. But to state such a capture tamely, was out of the question. The feat had to be "painted up," as if the angler had caught a sixteen pound great lake trout! But, as I have ventured to say, the trout is a really game fish, and as a rule fights to the last for its life and liberty.

The place to try an angler is a fine Border stream or a grand Highland loch; but I shall not presume to lay down minute directions as to *how* to angle, for an angler, like a poet, must be born, he can scarcely be bred, and no amount of book lore can confer upon a man the magic power of luring the wary trout from its crystalline home. The best anglers, and fish-poachers, are gipsies. A gipsy will raise fish when no other human being can move them. If encamped near a stream, a gipsy band are sure to have fish as a portion of their daily food; and how beautifully they can broil a trout or boil a grilse those only who have dined with them can say. Your gipsy is a rare good fisher, and with half a rod can rob a river of a few dozens of trout in a very brief space of time, and he can do so while men with elaborate "fishing machines," fitted up with costly tackle, continue to flog the water without obtaining more than a questionable nibble, just as if the fish knew that they were greenhorns, and took pleasure in chaffing them.

Mr. Cheek, who wrote a capital book for the guidance of those I may call Thames anglers, says that the best way to learn is to see other anglers at work—which is better than all the written

instructions that can be given, one hour's practical information going farther than a folio volume of written advice. It is all in vain for men to fancy that a suit of new Tweeds, a fair acquaintance with Stoddart or Stewart, and a large amount of angling "slang," will make them fishers. There is more than that required. Besides the natural taste, there is wanted a large measure of patience and skill; and the proper place to acquire these best virtues of the angler is among the brawling hill streams of Scotland, or on the expansive bosom of some Cumberland lake, while trying for a few delicious charr. A congregation of fish brought together by means of a scatter of food and an angler's taking advantage of the piscine convention over its diet of worms, is no more angling than a battue is sport. An American that I have heard of has a fish-manufactory in Connecticut; where he can shovel the animals out by the hundred; but then he does not go in for sport; his idea—a thoroughly American one—is money! But despite this exceedingly commercial idea, there are a few anglers in America, and as water and game fishes abound, there is plenty of sport. In North America are to be found both the true salmon and the brook trout: and as a great number of the American fishes visit the fresh and salt water alternately, they, by reason of their strength and size, afford excellent employment either to the river or sea angler. One of the best American fishes is called the Mackinaw salmon.

To come back, meantime, to Scotland and the trout, and where to find them, I may mention that that particular fish is the stock in trade of the streams and lochs of Scotland,—Scotland, the "land of the mountain and the flood,"—and there is an ever-abiding abundance of water, for the lochs and streams of that country are numberless. One county alone (Sutherland, to wit) contains a thousand lochs, and one parish in that county has in it two hundred sheets of water, all abounding with fine trout, affording sport to the angler—rewarding all who persevere with full baskets. As I have already hinted, the fisher must study his locality and glean advice from well-informed residents. The gipsies of a district can usually give capital advice as to the kind of bait that will please best. Many a time have anglers been seen flogging away at a stream or lake that was troutless, or at their wits' end as to which of their flies would please the dainty palate of my lord the resident trout. But I shall not further dogmatise on such matters; most people given to angling are quite as wise, on that subject at least, as the writer of these re-

marks; and there are as fine trout in England, I daresay, as there are in Scotland; indeed there are a thousand streams in Great Britain and Ireland where we can find fish—there are splendid trout even in the Thames. Then there are the Dove and the Severn, as well as rivers that are much farther away, so that on his second day from London an active angler may be whipping the Spey for salmon, or trolling on Loch Awe for the large trout that inhabit that sheet of water. The change of scene is of itself a delight, no matter what river the visitor may chose. At the same time the physical exertion undergone by the angler flushes his cheek with the hue of health, and imparts to his frame a strength and elasticity known only to such as are familiar with country scenes and pure air.

May and the Mayfly are held to inaugurate the angler's year; for although a few of the keenest sportsmen keep on angling nearly all the year round, most of them lay down their rod about the end of October, and do not think of again resuming it till they can smell the sweet fragrance of the advancing summer. Although few of our busy men of law or commerce are able to forestall the regular holiday period of August and September, yet a few do manage a run to the country at the charming time of May, when the days are not too hot for enjoyment nor too short for country industry. In August and September the landscape is preparing for the sleep of winter, whilst in May it is being robed by nature for the fêtes of summer, and, despite the sneers of some poets and naturalists, is new and charming in the highest degree. Town living people should visit the country in May, and see and feel its industry, pastoral and simple as it is, and at the same time view the charms of its scenery in all its vivid freshness and fragrance.

Some anglers delight in pike-catching, others try for perch; but give me the trout, of which there is a large variety, and all worth catching. In Loch Awe, for instance, there is the great lake trout, which, combined with the beauty of the scenery, has sufficed to draw to that neighbourhood some of our best anglers. The trout of Loch Awe, as is well known, is very ferocious, hence its scientific name of *Salmo ferox*. It attains to great dimensions; individuals weighing twenty pounds have been often captured; but its flavour is indifferent and the flesh is coarse, and not prepossessing in colour. This kind of trout is found in nearly all the large and deep lochs in Scotland. It was discovered scientifically about the end of last century by a Glasgow

merchant, who was fond of sending samples of it to his friends in proof of his prowess as an angler. The usual way of taking the great lake trout is to engage a boat to fish from, which must be rowed gently through the water. The best bait is a small trout, with at least half-a-dozen strong hooks projecting from it, and the tackle requires to be prodigiously strong, as the fish is a most powerful one, although not quite so active as some others of the trout kind, but it roves about in the deeper waters, enacting the part of bully and cannibal to all lesser creatures, and driving before it even the hungry pike. Persons residing near the great lochs capture these large trout by setting lines for them. As has been already mentioned, they are exceedingly voracious, and have been known to be dragged for long distances, and even after losing hold of the bait to seize it again with much eagerness, and so have been finally captured. These great lake trout are also to be found in other countries. Accompanied by friends, I have more than once interviewed the fierce *Salmo Ferox*, which, as Mr. St. John well said in one of his most readable articles, is no ignoble foe to fight with. A twenty pounder at the end of a common fishing line appears to have the strength of a whale. Persons desirous of capturing a specimen or two of the great lake trout must exercise patience; they cannot be got in every hour of the day, nor indeed are they to be had every day. Visitors are told sometimes that these fish have certain haunts, but to my inquiries the answer, when I paid a visit to the home of the *Ferox*, was, "not at home to-day." I have sailed over many miles of the water, and have, as it were, in the end found a fish by accident, and then it was hard work to get him on board, accompanied by some little swearing on the part of all concerned, as well as the necessary number of drams after our labours had ended. An angler should make it a point of honour to give his men a liberal share of the contents of his flask. If he neglects or forgets to do so, he may experience the fate of the Tweed fisher, who, when he was wetting his own whistle, ignored his attendant; Kerse at once pulled ashore and left the boat, telling his customer that, so far as he was concerned, those who drank by themselves might fish by themselves! It is a far cry from some places to Loch Awe, but once there the visitor is sure to come back again, the surroundings are so attractive.

In Lochleven, at Kinross, twenty-two miles from Edinburgh, there will be found localised that beautiful trout which is peculiar to this one loch, and which is frequently referred

to as one of the mysterious fishes of Scotland. This fish—although its quality is said to have been degenerated by the drainage of the lake in 1830, at which period it was reduced by draining to a third of its former dimensions—is of considerable commercial value: it cannot be bought in Edinburgh or London except at a fancy price; and if it was properly cultivated might yield a large revenue. I have not been able to obtain recent statistics of “the take” of Lochleven trout, but in former years, during the seven months of the fishing season, it used to range from fifteen thousand to twenty thousand pounds weight, and at the time referred to all trout under three-quarters of a pound in weight were thrown back into the water by order of the lessee. Eighty-five dozen of these fine trout have been known to be taken at a single haul, while from twenty to thirty dozen used to be a very common take. As to perch, they used to be caught in thousands. Little has or can be said about Lochleven trout, except that they are a speciality. Some learned people (but I take leave to differ from them) consider the Lochleven fish to be identical with *Salmo fario*, but never in any of my piscatorial wanderings have I found its equal in colour, flavour, or shape. It has been compared with the *Fario Lemanus* of the Lake of Geneva, and having handled both fishes, I must allow that there is very little difference between them; but still there are differences. Netting is not now allowed on the loch, but there is a large fleet of boats, which can be hired at Kinross for an hour or two's fishing on Lochleven.

I need not go over all the varieties of fresh-water fish *seriatim*, for their name is legion, and every book on angling contains lists of those peculiar to districts. If anglers' fishes ever become valuable as food, it can only be by the cultivation of our great lochs.

There are some pretty big pike in Lochleven. As every angler knows, the pike affords capital sport, and may be taken in many different ways. Pike spawn in March and April, when the fish leaves its hiding-place in the deep water and retires for procreative purposes into shallow creeks or ditches. The pike yields a very large quantity of roe on the average, and the young fish are not long in being hatched. Endowed with great feeding power, pike grow rapidly from the first, attaining a length of twenty-two inches. Before that period a young pike is called a jack, and its increase of weight is at the rate of about four pounds a year when well supplied with food. The appetite of this

fish is very great, and from its being so fierce, it has been called the pirate of the rivers. It is not easily satisfied with food, and numerous extraordinary stories of the pike's powers of eating and digesting have been from time to time related. I remember, when at school at Haddington (seventeen miles from Edinburgh), of seeing a pike that inhabited a hole in the "Lang Cram" (a part of the river Tyne), which was nearly triangular in shape, supposed to be the exact pattern of its hiding-place, and which devoured every kind of fish or animal which came in its way. It was hooked several times, but always managed to escape, and must have weighed at least twenty-five pounds. Upon one occasion it was hooked by a little boy, who fished for it with a mouse, when it rewarded him for his cleverness by dragging him into the water ; and had help not been at hand the boy would assuredly have been drowned, as the water at that particular spot was deep. As to the voracity of this fish many particulars have been given. Mr. Jesse, in one of his works, says that a pike of the weight of five pounds has been known to eat a hundred gudgeon in three weeks ; and I have myself seen them killed in the neighbourhood of a shoal of parr, and, notwithstanding their rapidity of digestion, I have seen four or five fish taken out of the stomach of each. The late Mr. Stoddart, one of our chief angling authorities, calculated the pike to be amongst the most deadly enemies of the infant salmon. He tells us in one of his books that the pike of the Teviot, a tributary of the Tweed, are very fond of eating young smolts, and says that, in a stretch of water ten miles long, where there is good feeding, there will be at least a thousand pike, and that these, during a period of sixty days will consume about a quarter of a million of young salmon !

One would almost suppose that some of the stories about the voracity of pike had been invented ; if only half of them be true, this fish has certainly well earned its title of shark of the fresh water. There is, for instance, the well-known tale of the poor mule, which a pike was seen to take by the nose and pull into the water ; but it is more likely I think that the mule pulled out the pike. Pennant, however, relates a story of a pike that is known to be true. On the Duke of Sutherland's Canal at Trentham, a pike seized the head of a swan that was feeding under water, and gorged as much of it as killed both. A servant, perceiving the swan with its head below the surface for a longer time than usual went to see what was wrong, and found both swan

and pike dead. A large pike, if it has the chance, will think nothing of biting its captor ; there are several authentic instances of this having been done. The pike is a long-lived fish, grows to a large size, and attains a prodigious weight. There is a narrative extant about one that was said to be two centuries and a half old, which weighed three hundred and fifty pounds, and was seventeen feet long. There is abundant evidence of the size of pike : individuals have been captured in Scotland, so we are told in the *Scots Magazine*, that weighed seventy-nine pounds. In the London newspapers of 1765 an account is given of the draining of a pool, twenty-seven feet deep, at the Lilishall Lime-works, near Newport, which had not been fished for many years, and from which a gigantic pike was taken that weighed one hundred and seventy pounds, being heavier than a man of twelve stone ! I have seen scores of pike which weighed upwards of half a stone, and a good many double that weight, but the weight is thought now to be on the descending ratio, the giants of the tribe having been apparently all captured. Formerly there used to be great hauls of this fish taken out of the water. Whether or not a pike be good for food depends greatly on where it has been fed, what it has eaten, and how it has been cooked. In fact, as I have already endeavoured to show, the animals of the water are in respect of food not unlike those of the land—their flavour is largely dependent on their feeding ; and pike that have been luxuriating on Lochleven trout, or feeding daintily for a few months on young salmon, cannot be very bad fare.

The carp family (*Cyprinidæ*) is very numerous, embracing among its members the barbel, the gudgeon, the carp-bream, the white-bream, the red-eye, the roach, the bleak, the dace, and the well-known minnow. There is one of the family which is of a beautiful colour, and with which all are familiar—I mean the golden carp, which may be seen floating in its crystal prison in nearly every home of taste, and which swarms in the ponds at Hampton Court, in the tropical waters of the Crystal Palace at Sydenham, as also in all the great aquariums. The gold and silver fish are natives of China, whence they were introduced into this country by the Portuguese about the end of the seventeenth century, and have become, especially of late years, so common as to be hawked about the streets for sale. In China, as we can read, every person of fashion keeps gold-fish by way of having a little amusement. They are contained either in the small basins that decorate the courts of the Chinese houses, or

in porcelain vases made on purpose ; and the most beautiful kinds are taken from a small mountain lake in the province of Che-Kyang, where they grow to a comparatively large size, some attaining a length of eighteen inches and a comparative bulk, the general run of them being equal in size to our herrings. These lovely fish afford much delight to the Chinese ladies, who tend and cultivate them with great care. They keep them in very large basins, and a common earthen pan is generally placed at the bottom of these in a reversed position, and so perforated with holes as to afford shelter to the fish from the heat and glare of the sun. Green stuff of some kind is also thrown upon the water to keep it cool, and it (the water), must be partially changed every two days, and the fish, as a general rule, must never be touched by the hand.

Great quantities of gold-fish are often bred in ponds adjacent to factories, where the waste steam being let in the water is kept at a warmish temperature. At the manufacturing town of Dundee they became at one time a complete nuisance in some of the factories, having penetrated into the steam and water pipes, occasionally bringing the works to a complete standstill. In England the golden carp usually spawns between May and July, the particular time being greatly regulated by the warmth of the season. The time of spawning may be known by the change of habit which occurs in this fish. It sinks at once into deep water instead of basking on the top, as usual ; previous to which the fish are restive and quick in their movements, throwing themselves out of the water, etc. It may be stated here, to prevent disappointment, that golden carp seldom spawn in a transparent vessel. A Mr. Mitchell of Edinburgh, however, brought out a hatching in his shop aquarium, in the Lothian Road, but the fry escaped by the waste pipe. When the spawn is hatched the fish are very black in colour, some darker than others : these become of a golden hue, while those of a lighter shade become silver-coloured. It is some time before this change occurs, a portion colouring at the end of one year, and others not till two or three seasons have come and gone. These beautiful prisoners seldom live long in their crystal cells, although the prison is beautiful enough, one would fancy :—

“ I ask, what warrant fixed them (like a spell
Of witchcraft fixed them) in the crystal cell ;
To wheel with languid motion round and round,
Beautiful, yet in mournful durance bound ! ”

Gold-fish ought not to be purchased except from some very respectable dealer. I have known repeated cases where the whole of the fish bought have died within an hour or two of being taken home. These golden carp, which are reared for sale, are usually spawned and bred in warmish water, and they ought in consequence to be acclimatised or "tempered" by the dealer before they are parted with. Parties buying ought to be particular as to this, and ascertain if the fish they have bought have been *tempered*.

Returning to the common carp, I can speak of it as being a most useful pond-fish. It is a vegetarian, and may be classed among the least carnivorous fishes; it feeds chiefly upon vegetables or decaying organic matter, and very few of them prey upon their kind, while some, it is thought, pass the winter in a torpid state. There is a rhyme which tells us that

"Turkeys, carp, hops, pickerel, and beer,
Came into England *all* in one year."

But this couplet must, I think, be wrong, as some of these items were in use long before the carp was known; indeed it is not at all certain when this fish was first introduced into England, or where it was brought from, but I think it extremely possible that it was originally brought here from Germany.

In ancient times there used to be immense ponds filled with carp in Prussia, Saxony, Bohemia, Mecklenburg, and Holstein, and the fish was bred and brought to market with as much regularity as if it had been a fruit or a vegetable. The carp yields its spawn in great quantities, no fewer than 700,000 eggs having been found in a fish of moderate weight (ten pounds); and, being a hardy fish, it is easily cultivated, so that it would be profitable to breed in ponds for the fishmarkets of populous places, and the fish-salesmen assure us that there would be a large demand for good fresh carp. It is necessary, according to the best authorities, to have the ponds in suites of three—viz. a spawning-pond, a nursery, and a receptacle for the large fish—and to regulate the numbers of breeding fish according to the surface of water. It is not my intention to go minutely into the construction of carp-ponds; but I may be allowed to say that it is always best to select such a spot for their site as will give the engineer as little trouble as possible. Twelve acres of water divided into three parts would allow a splendid series of ponds—the first to be three acres in extent, the second an acre more, and the third to be five acres;

and here it may be again observed that, with water as with land, a given space can only yield a given amount of produce, therefore the ponds must not be overstocked with brood. Two hundred carp, twenty tench, and twenty jack per acre is an ample stock to begin breeding with. A very profitable annual return would be obtained from these twelve acres of water; and, as many country gentlemen have even larger sheets than twelve acres, I recommend this plan of stocking them with carp to their attention. There is only the expense of construction to look to, as an under-keeper or gardener could do all that was necessary in looking after the fish. A gentleman having a large estate in Saxony, on which were situated no less than twenty ponds, some of them as large as twenty-seven acres, found that his stock of fish added greatly to his income. Some of the carp weighed fifty pounds each, and upon the occasion of draining one of his ponds, a supply of fish weighing five thousand pounds was taken out; and for good carp it would be no exaggeration to say that sixpence per pound weight could easily be obtained, which, for a quantity like that of this Saxon gentleman, would amount to a sum of £125 sterling. Now, I have the authority of an eminent fish-salesman for stating that ten times the quantity here indicated could be disposed of among the Jews and Catholics of London in a week, and could a regular supply be obtained, an unlimited quantity might be sold.

I have been writing about Highland streams and northern lochs; but the river scenery of England is, in its way, equally beautiful, and no river is more charming than the Thames. It is a classic stream, and its praises have been sung by the poets and celebrated by the historian. After Mrs. S. C. Hall and Thorne, it were vain to repeat its praises:—

“Glide gently, thus for ever glide,
O Thames! that anglers all may see
As lovely visions by thy side,
As now, fair river, come to me.
Oh, glide, fair stream, for ever so
Thy quiet soul on all bestowing,
Till all our minds for ever flow
As thy deep waters are now flowing.”

The total length of the river Thames is 215 miles. It has as affluents a great many fine streams, including the river Loddon, as also the Wey and the Mole. I am not entitled to consider it here in its picturesque aspects—my business with it is piscatorial,

and I am able to certify that it is rich in fish of a certain kind—

“ The bright-eyed perch with fins of Tyrian dye,
The silver eel in shining volumes rolled,
The yellow carp in scales bedropp'd with gold,
Swift trout diversified with crimson stains,
And pike, the tyrants of the watery plains.”

Considering that all its best fishing points are accessible to an immense population, many of whom are afflicted with a mania for angling, it is quite wonderful that there is a single fish of any description left in it ; and yet there are several bands of honest anglers who can fill occasional big baskets. I may be allowed just to run over a few Thames localities, and note what fish may be taken from them. Above Teddington at different places an occasional trout may be pulled out, but, although the finest trout may be got in the Thames, they are, unfortunately, so scarce in the meantime, that it is hardly worth while to lose one's time in the all but vain endeavour to lure them from their home. Pike fishing or trolling will reward the Thames angler better than trouting. There are famous pike to be taken every here and there—in the deep pools and at the weirs : and, as the pike is voracious, a moderately good angler, with proper bait, is likely to have some sport with this fish. But the specialty of the Thames, so far at least as most anglers are concerned, is the quantity of fish of the carp kind which it contains, as also perch. This latter fish may be taken with great certainty about Maidenhead, Cookham, Pangbourne, Walton, Labham and Wallingford Road ; and a kindred fish, the pope, in great plenty, may be sought for in the same localities. Then the bearded barbel is found in greater plenty in the Thames than anywhere else, and, as it is a fish of some size and of much courage, it affords great sport to the angler. The best way to take the barbel is with the “ Ledger,” and the best places for this kind of fishing are the deeps at Kingston Bridge, Sunbury Lock, Halliford, Chertsey Weir, and in the deeps at Bray, where many a time and oft have good hauls of barbel been taken. The best times for the capture of this fish are late in the afternoon, or very early in the morning. Chub are also plentiful in the Thames ; and Mr. Arthur Smith, who wrote a guide to Thames anglers, specially recommended the island above Goring for chub, also Marlow and the large island below Henley Bridge. This fish can be taken with the fly, and gives tolerable sport. The roach is a fish that

abounds in all parts of the Thames, especially between Windsor and Richmond; and in the proper season—September and October—it will be found in Teddington Weir, Sunbury Blackwater, Walton Bridge, Shepperton Lock, the Stank Pitch at Chertsey, and near Maidenhead, Marlow, and Henley Bridges. At Teddington I may state that the dace is abundant, and there are plenty of little fish of various kinds that can be had as bait at most of the places we have named. In fact, in the Thames there is a superabundance of sport of its kind, and plenty of accommodation for anglers, with wise “professionals” to teach them the art; and although the best sport that can be enjoyed on this lovely stream is greatly different from the trout-fishing of Wales or Scotland, it is good in its degree, and tends to health and high spirits, and an anxiety to excel in his craft, as one can easily see who ventures by the side of the water about Kew and Richmond.

“ With hurried steps,
The anxious angler paces on, nor looks aside,
Lest some brother of the angle, ere he arrive,
Possess his favourite swim.”

I come now to the perch, a well-known because common fish, about which a great deal has been written, and which is easily taken by the angler. There are a great number of species of this fish, from the common perch of our own canals and lochs to the “lates” of the Nile, or the beautiful golden-tailed mesoprion, which swims in the seas of Japan and India, and flashes out brilliant rays of colour. The perch was assiduously cultivated in ancient Italy, in the days when pisciculture was an adjunct of gastronomy, and was thought to equal the mullet in flavour. In Britain, the fish, left to its natural growth and no care being taken to flavour it artificially, is surpassed for table purposes by the salmon and the trout; but perch being abundant afford plenty of good fishing. The perch usually congregate in small shoals, and delight in streams, or water with a clear bottom and with overhanging foliage to shelter them from the overpowering heat of summer. These fish do not attain any considerable weight, the one recorded as being taken in the Serpentine, in Hyde Park, which weighed nine pounds, being still the largest on record. Perch of three and four pounds are by no means rare, and those of one pound or so are quite common.

The perch is a stupid kind of fish, and easily captured. Many of the foreign varieties of perch attain an immense weight. Some of the ancient writers tell us that the "lates" of the Nile attained a weight of three hundred pounds; and then there is the vacti of the Ganges, which is often caught five feet long. The perch, after it is three years old, spawns about May. It may be described as rather a hardy fish, as we know it will live a long time out of water, and can be kept alive among wet moss, so that it may be easily transferred from pond to pond. Its hardy nature accounts for its being found in so many northern lochs and rivers, as in the olden times of slow conveyances it must have taken a long time to send the fish to the great distances we know it must have been carried to. On the Continent living perch are a feature of nearly all the fishmarkets. The fish, packed in moss and occasionally sprinkled with water, are carried from the country to the cities, and if not sold are taken home and replaced in the ponds. This particular fish, which is very prolific, might be "cultivated" to any extent. Fish-ponds, although not now common, used to be at one time as much a food-giving portion of a country gentlemen's commissariat as his kitchen-garden or his cow-paddock.

As I have said so much about the Scottish lochs, it would be but fair to say a few words about those of England; but in good honest truth it would be superfluous to descant at the present day on the beauties of Windermere, or the general lake scenery of Cumberland and Westmoreland: it has been described by hundreds of tourists, and its praises have been sung by its own poets—the lake poets. It is with its fish that we have business, and honesty compels me to give the charr a bad character. It is not by any means a game fish, so far as sport is concerned; nor is it great in size or rich in flavour. But potted char is a rare breakfast delicacy. This fish, which is said by Agassiz to be identical with the ombre chevalier of Switzerland, is rarely found to weigh more than a pound; specimens are sometimes taken exceeding that weight, but they are scarce. The charr is found to be pretty general in its distribution, and is found in many of the Scottish lochs. It spawns about the end of the year, some of the varieties depositing their eggs in the shallow parts of the lake, while others proceed a short way up some of the tributary streams. In November great shoals of charr may be seen in the rivers Rothay and Brathay, particularly the latter, with the view of spawning. The charr, we are told by Yarrell, afford but scant

amusement to the angler, and are always to be found in the deepest parts of the water in the lochs which they inhabit. "The best way to capture them is to trail a very long line after a boat, using a minnow for bait, with a large bullet of lead two or three feet above the bait to sink it deep in the water ; by this mode a few charr may be taken in the beginning of summer, at which period they are in the height of perfection both in colour and flavour."

SEA ANGLING.

Of tastes in Sport—Sea Angling—Varieties of fish—Machinery of Capture—
Modes of Fishing—Lady Anglers—Localities—Arran.

It is a happy condition of humanity, I think, that we do not all take to one kind of sport. Some love to tread the heather of the Highlands and lay low the moor fowl, others prefer to search the stubbles and flush the flashing partridge, whilst others seek no other gamebird than the beautiful pheasant. There are men, again, who wish there were no winters, so that cricket might go on for ever; *au contraire*, in Scotland live not a few who would willingly add a month or two to the reign of King Frost, wishful to prolong the days of "the roaring game," and enjoy those glorious dinners of "curler's fare"—beef and greens and whisky toddy—so germane to the season. And what of the golfers? "Who would not be a golfer?" exclaim the untiring ones who tramp the daily round of Bruntsfield, North Berwick, or St. Andrew's links. And are there not those hardy Highland lads who think a match at "shinty" the game of games, not to speak of the multitudinous, lithe, and active kickers of the football? Who would dare to tell these men that any other sport is better than theirs? With yachtsmen and huntsmen I meddle not at present, nor yet with "chamberers." There are men, however, who can sit for long nights over the fascinating draught-board, or who are adepts at the game of chess, men who never handle gun or rod, and who heave a regretful sigh when the crowing cock of daybreak warns them that their hour of departure has arrived. Men who sit in club chambers and gamble at cards, for the sake of what they can win from their companions, I hold no terms with; they are in no sense "sportsmen." It is with those only who love our bracing out-of-door games and sports that I have sympathy; the active men of muscle, who wield the bat or handle the fishing rod, who stalk the bounding deer of the Highland glens and forests, the stalwart and the brown-skinned sportsmen, whose days in the open air are as a leaf in the book of nature, and whose nights know no dreams but those of the day's achievements.

“ There is a sweetness in the mountain air,
A life that bloated ease can never hope to share.”

All the sports and pastimes I have named are each of them excellent, after their several kinds, and it is seldom, indeed, that they pall or grow stale. The scenes are ever changing, ever new; the aspects of nature are so varied that men return again and again to a favourite resort with a renewed sense of pleasure. And what is true of the mountain and the moor is equally true of the “changeable sea,” on which many men are beginning to find that they can spend a few weeks with great satisfaction, there being no lack of manly pastimes of the most varied kind, monsters of the deep to tackle and fowls of the air to pursue to their rocky homes.

“No end of sport” may be obtained in the sea; that capital sea-angling may be enjoyed all the year round, and all round the British coasts; and that there are fighting fishes in the waters of the great deep that will occasionally try both the cunning and the nerve of the best anglers, has been again and again made manifest. The greatest charm of sea-angling, however, lies in its very simplicity, and the readiness with which it can be engaged in, together with the comparatively homely and inexpensive nature of the instruments required. A party living at the seaside can either fish off the rocks or hire a boat, and purchase, or obtain on loan (for a slight consideration) such simple tackle as is necessary; though it must not be too simple, for even sea-fish will not stand the insult of supposing they can be caught as a matter of course with anything; and as the larger kinds of hooks are often scarce at small fishing villages, it is better to carry a few to the scene of action.

“Well then, what sport does the sea afford?” will most likely be the first question put by those who are unacquainted with sea-angling.

I answer, anything and everything in the shape of fish or sea-monster, from a sprat to a whale. This is literally true. It is not an unfrequent occurrence for tourists in Orkney, or other places in Scotland, to assist at a whale battue; and some of my readers may remember a very graphic description of an Orcadian whale-hunt, given in *Blackwood's Magazine*, by the late Professor Aytoun, who was Sheriff and Admiral of Orkney. The kind of sea-fish, however, that are most frequently taken by the angler, both on the coasts of England and Scotland, are the whiting, the common cod, the beautiful poor or power cod, and the mackarel;

there is also the abundant coal-fish, or sea-salmon as I call it, from its handsome shape. This fish is taken in amazing quantities, and in all its stages of growth. It is known by various names, such as sillock, piltock, cudden, poddly, etc.; indeed most of our fishes have different names in different localities; but I shall keep to the proper name so as to avoid mistakes.

The merest children are able, by means of the roughest machinery, to catch any quantity of young coal-fish; they can be taken in our harbours, and at the sea-end of our piers and landing-places. The whiting is also very plentiful, so far as angling is concerned, as indeed are most of the Gadidæ. It feeds voraciously, and will seize upon anything in the shape of bait; several full-grown pilchards have been more than once taken from the stomach of a four-pound fish. Whiting can be caught at all periods of the year, but it is of course most plentiful in the breeding season, when it approaches the shores for the purpose of depositing its spawn—that is in February and March. The common cod-fish is found on all parts of our coast, and the sea-anglers, if they hit on a good locality—and this can be rendered a certainty—are sure to make a very heavy basket.

The pollack, or, as it is called in Scotland, lythe, also affords capital sport; and the mackerel-herring and conger-eel can be captured in considerable quantities. I can strongly recommend lythe-fishing to gentlemen who are *blasés* of salmon or pike, or who do not find excitement even among the birds of lone St. Kilda. Then, as will afterwards be described, there is the extensive family of the flat fish, embracing brill, plaice, flounders, soles, and turbot. The latter is quite a classic fish, and has long been an object of worship among gastronomists; it has been known to attain an enormous size. Upon one occasion an individual, which measured six feet across, and weighed one hundred and ninety pounds, was caught near Whitby. The usual mode of capturing flat fish is by means of the trawl-net, but some varieties of them may be caught with a hand-line. A day's sea-angling will be chequered by many little adventures. There are various minor monsters of the deep that vary the monotony of the day by occasionally devouring the bait. A tadpole-fish, better known as the sea-devil or "the angler," may be hooked, or the fisher may have a visit from a hammer-headed shark or a pile-fish, which adds greatly to the excitement; and if "the dogs" should be at all plentiful, it is a chance if a single fish be got out of the sea in its integrity. So voracious and

active are this species of the *Squalidæ*, that I have often enough pulled a mere skeleton into the boat, instead of a plump cod of ten or twelve pounds weight.

I shall now say a few words about the machinery of capture. The tackle in use for handline sea-fishing is much the same everywhere, and that which I describe will suit almost any locality. It consists of a frame of four pieces of wood-work about a foot and a half in length, fastened together in the shape of such a machine as ladies use for certain worsted work. Round this is wound a thin cord, generally tanned, of from ten to twenty fathoms in length. To the extreme end of this line is attached a leaden sinker, the weight of which varies according as the current of the tide is slow or rapid. About two feet above the sinker is a cross piece of whalebone or iron, to the extremities of which the strings on which the hooks are dressed are attached. Sometimes a third hook is fixed to an outrigger, about two feet above the other hooks. The length of the cords to which the lower hooks are attached should be such as to allow them to hang about six inches higher than the bottom of the sinker. In some parts of the Western Islands a rod consisting of thin fir is used, but from the length of line required it is rather a clumsy instrument, as after the fish has been struck the rod has to be laid down in the boat, and the line to be hauled in by hand.

As to bait, it is quite impossible to lay down any strict rule. The bait which is the favourite in one bay or bank is scouted by the fish of other localities. At times almost anything will do : numbers of mackerel have been taken with a little bit of red cloth attached to the hook ; on certain occasions the fish are so hungry that they will swallow the naked iron ! On the English coasts, and among the Western Islands of Scotland, a most deadly bait is boiled limpets, which require to be partially chewed by the fisher before placing them on the hooks ; in other places mussels are the favourites, and in others the worms procured among the mud of the shore. The limpet has this one advantage, that it is easily fixed on the hook, and keeps its hold tenaciously. A very excellent bait for the larger kinds of fish is the soft part of the body of small crabs, which are gathered for that purpose at low tide under the stones ; a good place for procuring them is a mussel-bed. The best time for fishing is immediately before ebb or flow. The hooks being baited, the line is run over the side of the boat until the lead touches the bottom,

when it is drawn up a little, so as to keep the baits out of reach of the crabs who gnaw and destroy both bait and tackle. The line is held firmly and lightly outside the boat, the other hand, inside the boat, also having a grip of the line. The moment a fish is felt to strike, the line is jerked down by the hand inside, thus bringing it sharply across the gunwale and fixing the hook. A little experience will soon enable the angler to determine the weight of the fish, and according as it is light or heavy must he quickly or slowly haul in his line. When the fish reaches the surface, he should, if practicable, seize it with his hand, as it is apt, on feeling itself out of water, to wriggle off. A landing-clip or gaff, such as is used in salmon fishing, is useful, as in the event of hooking a conger or a ray, there is much difficulty, and even some danger.

In fishing for lythe—the most exciting of all sea-angling—a very strong cord is used, on which, in order to prevent the fouling of the line, one or two stout swivels are attached. The hooks also cannot be too strong; those used for cod or ling fishing are very suitable. The baits in general use are the body of a small eel, about half a foot in length, skinned and tied to the shaft; or a strip of red cloth, or a red or white feather similarly attached. A piece of lead is fixed on the line at a short distance above the hook.

The boat must be rowed or sailed at a moderate rate, and from five or ten fathoms of the line allowed to trail behind. The boat end of the line should be turned once or twice round the arm, and held tightly in the hand; if the line were fastened to the boat, there is every chance that a large lythe—and they are frequently caught upwards of thirty pounds weight—would snap the tackle. The fish, when hooked, gives considerable play, and rather strongly objects to being lifted into the boat. The clip or gaff is in this case always necessary. In fishing for lythe, mackerel and dogfish are not unfrequently caught. The best place for prosecuting this sport is in the neighbourhood of a rocky shore; and the best times of the day are the early morning and evening. This fish will also take readily during any period of a dull but not gloomy day.

The most amusing kind of sea-angling is fly-fishing for small lythe and saithe (coal-fish). The tackle is exceedingly simple: a rod consisting of a pliant branch about eight feet long, a line of light cord of the same length, and a little hook roughly busked with a small white, red, or black feather. The fly is

dragged on the surface as the boat is rowed along, and the moment the fish is struck it is swung into the boat. The fry of the lythe and saithe may also be fished for from rocks and pier-heads, using the same tackle. A very ingenious plan for securing a number of these little fish is carried on in the Firth of Clyde and elsewhere. A boat similar in shape to a salmon-coble, with a crew of two—one to row and one to fish—goes out along the shore in the evening, when the sea is perfectly calm or nearly so. The fisher has charge of half-a-dozen rods or more, similar to the one already mentioned. These rods project across the square stern of the boat, and their near ends are inserted into the interstices of a seat of wattled boughs, on which the fisher sits, not steadily, but bumping gently up and down, communicating a trembling motion to the flies. The course of the coble is always close in shore, and if the fish are taking well, the same ground may be fished over many times during the course of the evening.

As to the set-line-fishing, it can only be practised in places where the tide recedes to a considerable distance. The cord used is of no defined length, and at certain distances along its entire extent are affixed corks to prevent the hooks sinking in the sand or mud. The shore-end is generally anchored to a stone, and the further end fastened to the top of a stout staff firmly fixed in the beach, and generally attached also to a stone to prevent it drifting ashore in the event of being loosened from its socket. From the staff almost to the shore, hooks are tied along the line at distances of a yard. The hooks are baited at low tide, and on the return of next low tide the line is examined. This is neither a satisfactory nor sure method of fishing, as many of the fish wriggle themselves free, and clear the hook of the bait, and many, after being caught, fall a prey to dogfish, etc., so that the disappointed fisher, on examining his line, too often finds a row of baitless hooks, alternating with the half-devoured bodies of haddocks, flounders, saithe, and other shore fish.

I may just name another mode of obtaining sport, which is by spearing flat fish, such as flounders, dab, plaice, etc. No rule can be laid down on this method of fishing. It has been carried on successfully by means of a common pitchfork, but some gentlemen go the length of having fine spears made for the purpose, very long and with very sharp prongs; others, again, use a three-pronged farm-yard "graip," which has been known to do as much real work as more elaborate utensils specially contrived

for the purpose. The simplest directions I can give to those who try this style of fishing are just to spear all the fish they can see, but the general plan is to stab in the dark with the kind of instrument delineated above. At the mouths of most of the large English rivers there is usually abundance of all the minor kinds of flat fish.

Lobsters and crabs can be taken at certain rocky places of the coast; mussels can be picked from the rocks, and cockles can be dug for in the sand. Shrimps can also be taken, and various other wonders of the sea and its shores may be picked up. After a storm a great number of curious fishes and shells may be gathered, and some of these are very valuable as specimens of natural history. The apparatus for capturing lobsters and crabs is like a cage, and is generally made of wicker work, with an aperture at the top or the side for the animal to enter by; it can be baited with any sort of garbage that is at hand. Having been so baited, the lobster-pot is sunk into the water, and left for a season, till, tempted by the mess within, the game enters and is caged. Those who would induce crabs to enter their pot must set them with fresh bait; lobsters, on the other hand, will look at nothing but garbage. Very frequently rock-cod, saithe, and other fish, are found to have entered the pots, intent both on foul and fresh food. Shell-fish for bait can be taken by means of a wooden box or old wicker basket sunk near a rocky place, and filled with garbage of some kind; the whelks and small crabs are sure to patronise the mess extensively, and can thus be obtained at convenience. It is impossible to tell in the limits of a brief chapter one half of the fishing wonders that can be accomplished during a sojourn at the sea-side. A visit to some quaint old fishing town, on the recurrence of "the year's vacation Sabbath," as some of our poets now call the annual month's holiday, might be made greatly productive of real knowledge; there are ten thousand wonders of the shore which can be studied besides those laid down in books. By the way, sea angling is a sport in which ladies may be permitted to join, taking care not to indulge in too long a spell of the sport at one time. Ladies now make no bones about handling the salmon rod, and some dames of quality can land a sixteen-pound salmon quite as deftly as their fathers or brothers. One of the daughters of England (Princess Louise Marchioness of Lorne) sent a large salmon of her own capturing from her Canadian home as a present to her mother, the Queen.

I have seen ladies who were clever at the sport of sea angling. How deftly they capture the pollock, or lythe!

As will be noted, I have avoided as much as possible the naming of localities, preferring to state the general practice. In all seaside towns and fishing villages there are usually three or four old fishermen who will be glad to do little favours for the curious in fish lore—to hire out boats, give the use of tackle, and point out good localities in which to fish. For such as have a few weeks at their disposal, I would suggest the western sea-lochs of Scotland as they afford superb sport in all the varieties of sea-angling. Fish of all kinds, great and small, are to be found in tolerable quantity, and there is likewise the still greater inducement of fine scenery, cheap lodgings, and moderate living expenses. But the entire change of scene is the grand medicine; nothing would do an exhausted London or Manchester man more good than a month on Lochfyne, where he could not only angle in the great water for amusement, but also watch the commercial fishers, and enjoy the finely-flavoured herring of that loch as a portion of his daily food. If persons in search of sea-angling wish to combine the enjoyment of picturesque scenery with their pleasant labours on the water, they cannot do better than select the rural village of Corry, on the Island of Arran, as a centre from which to conduct their operations.

Our angler, having arrived at Glasgow, can go down the Clyde by steamboat direct to Arran. There is another and a quicker way—viz., by railway to Ardrossan and steamboat to Brodick, but most strangers prefer the river; and let me say here, without fear of contradiction, there is no pleasure river equal to the Clyde, especially as regards accessibility. The steamers from Glasgow peer at stated intervals into every nook and cranny of the water, and, on the Saturdays especially, deposit perfect armies of people at various towns and villages below Greenock, who are thus enabled to pass the Sunday in the bright open air by the clear waters of this great stream. Any kind of lodging is put up with for the sake of being “down the water;” and all sorts of people—merchants even of high degree, and “Glasgow bodies” of lower social standing—are contented, chiefly no doubt at the instigation of their better halves, to sojourn in places that when at home they would think quite unsuitable for even the Matties of their households. The banks of the Clyde have become wonderfully populous within the last thirty-five years—villages have expanded into towns, hamlets

have grown into villages, and single cottages into hamlets. To speculators in want of an idea I would say: Rush to the Clyde, and buy up every inch of land that can be procured within a mile of the water, build upon it, and from the half million of human beings who tenant Glasgow and the surrounding towns I will engage to find two competing occupants for every house that can be put up. Building has progressed even in Arran, and this too despite the Duke of Hamilton's dislike to strangers, so that there is now a population on the island of about 7000. A friend of mine says that such an important entity as a duke has no right to do as he likes with his own, and consequently that Arran ought to be built upon, and blackcocks and other game birds be left to take their chance. Even with such limited accommodation as can be now obtained, Arran is a delightful summer residence; were it to be generally built upon, it would realise from ground-rents alone an annual fortune to his Grace the Duke of Hamilton, who owns the greater part of it, and he might have capital shooting into the bargain.

Arran, I may state to all who are ignorant of the fact, is a very paradise for geologists; and amateur globe-makers—persons who think that they are better at constructing worlds than the Great Architect who preceded them all—are particularly fond of that island, being, as they suppose, quite able to find upon it *materiel* sufficient for the erection of the largest possible “theories.” Figures, it is said, can be made to prove either side of a cause; so can stones. Each geologist can build up his own pet world from the same set of rocks; and so active geologists proceed to stucco over with their own compositions—“adumbrate,” a friend calls the process—the sublime works of the greatest of all designers. None of the sciences have given rise to so much controversy as the science of geology. I make no pretensions to much geologic knowledge, although I do know a little more than the man who wondered if the granite boulders which he saw on a brae-side were on their way up or down the hill, and argued that it was a moot point. What I would like to see would be a good work on geology, divested entirely of the learned and scientific slang which usually makes such books entirely useless to ninety-nine out of every hundred who attempt to read them. I would like, moreover, a work that would not bully us with a ready-made theory.

We had been landed from the steamboat on a massive grey boulder, on the sides of which, thick as was the atmosphere, we

observed dozens of limpets and crowds of "buckies," and other sea-ware, giving us token of ample employment when we could obtain leisure for a more minute survey of the rocks and stray stones which sprinkle the sea-beach of Corry. In the meantime, that is just after landing, the great, the momentous question on this and every other Saturday night is—Is *the* inn full? A hurried scramble over the jagged stones, and a rush past the very picturesque residence of Mr. Douglas' pigs, brought us to the inn, and at once decided the question, Mrs. Jamison, the landlady, shook her lawn-bedizened head—the inn, alas, *was* full, overflowing in fact, for a gentleman had engaged the coach-house! It was feared, too, that every house in the village was in a like predicament, and further enquiry soon confirmed this to us rather awful statement, and so I was left standing at the inn-door, with a bitingly shrewd companion, to solve this problem—Given the barest possible accommodation throughout all Corry for only forty-eight strangers, how to shake fifty into the village, so that each might have somewhere to lay his head? This is a problem, I suspect, that few can answer. What was to be done? The steamboat had gone! Were we then to tramp on to Brodick, with more than a suspicion of a rainy night in the moist atmosphere, or try a shake-down of clean straw in a lime-quarry? It might have come to that, and as both of us had before then camped out for a night by the sheltered side of a haystack, we might have arranged, fortified by the aid of a dram, or perhaps two, to pass a tolerable night in the lime cavern beside a very canny-looking horse-of-all-work that we caught a glimpse of through the gloom of the place while peeping into it.

Fortunately it occurred that a modest maiden lady, a very "civil-spoken" woman indeed, by name Grace Macalister, had been disappointed of two Glasgow gentlemen, who had engaged her whole house, and so the two benighted travellers from the east were accepted, at the instigation of the late Mr. Douglas, a well-known man in Corry, in lieu of them. Taking possession of our lodgings at once, we formed ourselves into a committee of supply, which resulted in a prompt expenditure of a sum of six shillings and threepence, the particulars of which, for the benefit of my readers, and to show how primitive we had all at once become, I beg to subjoin—namely, bread, 7d.; mutton, 2s. 4d.; butter, 6½d.; tea, 6d.; sugar, 3d.; milk, ½d.; herring, 2d. This sum, with eighteenpence added for whisky, threepence for potatoes, and one penny for a candle, represented the total com-

missariat expenses of two persons in Corry for five wholesome but homely meals. Our bed cost us one shilling each per night, and our attendance and washing were charged at the rate of a shilling a day, so long as we used the Hotel Macalister, but even this did not very much swell the grand total of the bill, which, at such rates, was by no means heavy at the end of our holiday ramble over Arran, especially when it is considered that the Arran season does not very greatly exceed one hundred days. Our quarters were certainly primitive enough—namely, half of a thatched cottage, or rather hut we may call it,—consisting of one apartment containing two beds, four chairs, a small table, and a little cupboard. The beds were curtained by a series of blue striped cotton fragments of three different patterns of an old Scotch kind, and the walls were papered with five different kinds of paper ; but the low roof was the greatest treat of all—it was covered with old numbers of the *Witness* newspaper, at the time when it was edited by Hugh Miller, and these had, no doubt, been left in the cottage by previous travellers. The floor was covered with fragments of canvas laid down as a carpet. Many tourists would perhaps turn up their noses at this humble cottage, but to my friend and myself it was a delightful change.

I have not space in which to particularise all the beauties of Arran, but I must say a word or two about Glen Sannox. Near the golden beach of Sannox Bay is situated the solitary churchyard of Corry, with its long grass waving rank over the graves, and its borders of fuchsias laden with brilliant blossoms. There was, we observed, on peeping over the wall, a new-made grave, that of an orphan girl who had been drowned while bathing. Passing the churchyard—there was once a church at the place, but all trace of it, save one stone built into the wall of the churchyard has long passed away—we came upon a brawling stream, which led us up to the ruins of what had been a Barytes-mill. The stones lay around in great masses, as if they had been suddenly undermined by the passing stream, and had fallen cemented as they stood. In a year or two they will be grown over with weeds, and in a century hence some persons may ingeniously speculate on the ruins, and give a learned disquisition as to the building that once stood there, and its uses. My friend and I wondered what it had been, but an old man told us all about it ; and strange to say, in the course of conversation, we found this old resident reciting scraps of Ossian's poems. He told us, too, that the bard had died in the very parish in

which we were standing. He believed Ossian to have been a priest and teacher of the people, and this was an idea that was quite new to us. We had heard before, or rather read, that the poet was by some esteemed a great warrior, and by others a necromancer—perhaps to esteem him a teacher is right enough; his poems, at any rate, were at one time as familiar in the mouths of the West Highlanders as household words.

The scenery of Arran would certainly inspire a poet. As we penetrated into Glen Sannox it became most interesting, whether we noted the brawling and bubbling brook, or the rich carpet of heath and wild flowers upon which we trod. The luxuriance of its wild flowers is remarkable, and of its rabbits equally so. As we proceed up the glen, the lofty hills with their granitic scars frown down upon us, and one with a coroneted brow looks kingly among the others, as the mists float upon their shoulders, like a waving mantle, and with their bold and rugged precipices they seem as if they had just been suddenly shot out from the bosom of the earth. Glen Sannox is sublime indeed; its magnitude is remarkable, and it is so hemmed in with hills as to look at once, even without any details, or the aid of history, a fitting hiding-place for the gallant Bruce and his devoted followers. About three miles north from this glen we can view—and, we venture to say, not without astonishment—the falling fragments of the broken mountain; a stream of large stones that lie crowded on the declivity of the hill, till they in one long trail reach the ocean. But to enumerate a tithe even of the scenic and antiquarian beauties of the island would require—nay, it has obtained, and more than once—a volume. I could dwell upon the blue rock near Corry, and picture the overhanging cliffs of the neighbourhood mantled o'er with ivy. The visitor might enter some of the caves which have been scooped out by the sea, or wander among the rock pools of the indented shore, rich with treasures wherewith to feed the greedy eye of the naturalist, and view the ladies, with kilted coats, doing their daily lessons from Glaucus, collecting pretty shells, bottling anemones, or gathering sea-weeds wherewith to ornament their botanic albums. At last, after a long day's work of wandering and climbing, we long for a quiet seat and a refreshing cup of tea, and by and by, when the night shuts us out from active labour, we hie us to our box bed, in order to stretch our wearied limbs in Miss Macalister's well-lavendered sheets; and, as we are just attempting to coax the balmy goddess to close our eyes with

her soft fingers, we hear the landlady in her garret reading her nightly chapter from her Gaelic Bible, with that genuine droning sound incidental to the West Highland voice.

I have more than once after nightfall passed a quiet half-hour at our cottage door inhaling the saline breath of the mighty sea. The look-out at midnight is very beautiful : the Cumbræ light looked like a monitor telling us that even at that dread hour we were watched over. On the opposite coast of Ayr a huge iron-work threw a lurid glare upon the bosom of the sea, and almost at my feet the restless waves were playing a mournful dirge on the boulder-crowded beach. I could see along the water to Holy Island, and could almost feel the silence that at that moment would render the cave of old Saint Molio a wondrous place for holding a feast of the imagination, the viands being brought forward from a far-back time, and the island again peopled with the quaint races that had passed a brief span of life upon its shores—who had been warmed by the same sun as had that day shone upon me, and whose nights had been illumined by the same moon that was now shimmering its soft radiance upon the liquid bosom of the sparkling waters.

NATURAL HISTORY OF THE OYSTER.

Description of the Oyster—Controversies about Oyster-Life—Do Oysters live upside down?—The Spawning of Oysters—Oyster-Growth—When do Oysters become reproductive?—Sergius Orata—Lake Fusaro—Oyster-Fascines and tiles.

ZOOLOGICALLY the oyster is known as *Ostræa edulis*. Its outward appearance is familiar to even very landward people, and no human engineer could have invented so admirable a home for the pulpy and headless mass of jelly that is contained within the rough-looking shell.

Many curious opinions have been held about this mollusc. At one time oysters were thought to be only masses of oily or other matter, scarcely alive and insensible to pain. Who would suppose, it was asked, that a portion of blubber like the oyster, that could only have been first eaten by some very courageous individual, would have any feeling? But we know better now, and although the organisation of the mollusca is not of a high order, it is perfect of its kind, and has within it indications of organs that in beings of a higher type serve a loftier purpose, and point out the beginnings of nature, showing how she works her way from the simplest imaginings of animal life to the complex human machine. The oyster has no doubt in its degree many joys and sorrows, and throbs with life and pleasure, as animals do that have a higher organic structure.

The oyster is curiously constructed; but I fear that, comparatively speaking, very few of my readers have ever seen a perfect one, as oysters are very much mutilated, being generally deprived of their beards before they are sent to table, and otherwise hurt, both accidentally in the opening and by use and wont, as in the case of the beard. Its mouth—it has no jaws or teeth—is a kind of trunk or snout, with four lips, and leafy coverings or gills are spread over the body to act as lungs, and keep from the action of the water the air which the animal requires for its existence. This covering is divided into lobes with ciliated edges. Four leaves or membranous plates act as capillary funnels, open at the farthest extremities. Behind the gills there is a large whitish

fatty part enclosing the stomach and intestines. The vessels of circulation play into muscular cavities, which act the part of the heart. The stomach is situated near the mouth. The oyster has no feet but can move by opening and closing its shell, and it secures food by means of its beard, which acts as a kind of rake. In fact the internal structure of the oyster, while it is excellently adapted to that animal's mode of life, is exceedingly simple.

It is not my purpose in the present work to enter into the minutiae of oyster life. Indeed, there have been so many controversies about the natural history of this animal as to render it impossible to narrate in the brief space I can devote to it a tenth part of what has been written or spoken about the life and habits of the "breedy creature." Every stage of its growth has been made the stand-point for a wrangle of some kind. As an example of the keenness with which each stage of oyster life is now being discussed, I may mention that some years ago a most amusing squabble broke out in the pages of the *Field* newspaper on an immaterial point of oyster life, which is worth noting here as an example of what can be said on either side of a question. The controversy hinged upon whether an oyster while on the bed lay on the flat or convex side. Mr. Frank Buckland, who originated the dispute, maintained that the right, proper, and natural position of the oyster, when at the bottom of the sea, is with the flat shell downwards; but the natural position of the oyster is of no practical importance whatever; and I know, from personal observation of the beds at Newhaven and Cockenzie, that oysters lie both ways,—indeed, with a dozen or two of dredges tearing over the beds it is impossible but that they must lie quite higgledy-piggledy, so to speak. A great deal that is incidentally interesting was brought up in the *Field* discussion. There have been several other disputes about points in the natural history of the oyster—one in particular as to whether that animal is provided with organs of vision. Various opinions have been enunciated as to whether an oyster has eyes, and one author asserts that it has so many as twenty-four, which again is denied, and the assertion made that the so-called eyes projecting from the border of the mantle have no optical power whatever; but, be that as it may, the oyster *has* a power of knowing the light from the dark.

As is well known, there is a period every year during which the oyster is not fished; and the reason why our English oyster-beds have not been altogether exhausted by over fishing arises,

among other causes, from there being a definite close-time assigned to the breeding of the mollusc. The fact that oysters are supplied only during certain months in the year, and that the public have a corresponding notion that they are totally unfit for food during May, June, July, and August (those four wretched months which have not the letter "r" in their names), has been greatly in their favour. Had there been no period of rest, it is almost certain that oysters would long ago—I allude to the days when there was no system of cultivation—have become extinct. Oysters begin to sicken about the end of April, so that it is well that their grand rest commences in May. The shedding of the spawn continues during the whole of the hot months—not but that during that period there may be found supplies of healthy oysters, but, as a general rule, it is better that there should be a total cessation of the trade during the summer season, because were the beds disturbed by a search for the healthy oysters the spawn would be scattered and destroyed.

Oysters incubate their ova, in the folds of their mantle, and among the laminæ of their lungs. There the ova remain surrounded by mucous matter, necessary to their development, and within which they pass through the embryo stage. The mass of ova, or "spat" as it is familiarly called, undergoes various changes in its colour, meanwhile losing its fluidity. This state indicates, it has been said, the near termination of the development and the sending forth of the embryo to an independent existence, for by this time the young oysters can live without the protection of the maternal organs. An eminent French pisciculturist says that the animated matter escaping from the adults on breeding-banks is like a thick mist being dispersed by the winds—the *spat* is so scattered by the waves that only an imperceptible portion remains near the parent stock. All the rest is dissipated over the sea space: and if these myriads of animalculæ, tossed by the waves, do not meet with solid bodies to which they can attach themselves, their destruction is certain, for if they do not fall victims to the larger animals which prey upon them, they are unfortunate in not fixing the proper place for their thorough development.

Thus we see that the spawn of the oyster is well matured before it leaves the protection of the parental shell; and by the aid of the microscope the young animal can be seen with its shell perfect and its holding-on apparatus, which is also a kind of swimming-pad, ready to clutch the first "coigne of vantage" that

the current may carry it against. My "theory" is, that the parent oyster goes on *brewing* its spawn for some time—I have seen it oozing from the same animal for several days—and it is supposed that the spawn swims about with the current for a short period before it "falls," being in the meantime devoured by countless sea animals of all kinds.* The operation of nursing, brewing, and exuding the spat from the parental shell will occupy a considerable period—say from two to three weeks. It is quite certain that a close-time for oysters is necessary and advantageous, for we seldom find this mollusc, as we do the herring and other fish, full of eggs, so that most of the operations connected with its reproduction go on in the months during which there is no dredging. Immense quantities of the spawn of oysters are annually devoured by other molluscs, and by fish and crustaceans of various sizes; it is well, therefore, that it is so bountifully supplied. On occasions of visiting the beds I have seen the dredge covered with this spawn; and no pen could number

* The following theory of the spat was promulgated by the author through the columns of the *Times*:—"In an open expanse of sea the spat may be carried to great distances by tidal influence, or a sharp breeze upon the water may waft the oyster-seed many a long mile away. Every bed has its own time of spatting—thus, one of a series of scalps may be spatting on a fine warm day, when the sea is like glass, so that the spat cannot fail to fall; while on another portion of the beds the spat may fall on a windy day, be thus left to the tender mercy of a fiercely receding tide, and so be lost, or fall mayhap on ungenial bottom a long way from the shore. On the Isle of Oleron, which supplies the green oyster breeders of Marennes with such large quantities, it is quite certain that in the course of the summer a friendly wave will waft large quantities of spat into the artificial parcs, when it is known that the oysters in these parcs have not spawned. Where does this foreign spat come from? The men say it comes off some of the natural beds of the adjoining sea—is driven in by the tide, and finds a welcome resting-place on the artificial receivers of their parcs. It is altogether an erroneous idea to suppose that there are some seasons when the oyster does not spat, because of the cold weather, etc. Some of the parcs had spat at Arcachon this year [1860] in very ungenial weather. The spatting of the oyster does not depend on the weather at all, but the destination of the spat does, because if the tiny seedling oyster does not fall on propitious ground it is lost for ever. New oyster-beds are often discovered in places where it is certain oysters did not exist in previous years. How came they then to be formed? The spat must have been blown upon that ground by the ill wind that carried it away from the spot where it was expected to fall. If the spat exuded by the large quantity of Oysters known to be stocked in the parcs at Whitstable, in Kent, the home of the "native," were always to fall on the cultch of Whitstable, instead of on the adjoining flats and elsewhere, the company would soon become enormously wealthy.

the millions of oysters thus prevented from ripening into life. Economists ought to note this fact with respect to fish generally, for the enormous destruction of spawn of all kinds must exercise a very baneful influence on our fish supplies.

Some people have asserted that the oyster can reproduce its kind in twenty weeks, and that in ten months it is full-grown. Both of these assertions are pure nonsense. At the age of three months an oyster is not much bigger than a pea; and the age at which reproduction begins has never been accurately ascertained, but it is thought to be three years. Oysters are usually four years old before they are sent to market. At the age of five years the oyster is, I think, in its prime; and some of our most intelligent fishermen estimate its average duration of life at ten years.

In these days of oyster-farming the time at which the oyster becomes reproductive may be easily fixed, and it will no doubt be found to vary in different localities. At some places it becomes saleable—chiefly, however, for fattening—in the course of two years; at other places it is three or four years before it becomes a saleable commodity; but on the average it will be quite safe to assume that at four years the oyster is both ripe for sale and able to reproduce its kind. Let us hope that all breeders will take care to have at least one brood from each batch if they can get it before they offer any for sale. Oyster-farmers should keep before them the folly of the salmon-fishers, who kill their grilse—*i.e.* the virgin fish—before they have an opportunity of perpetuating their race.

Another point on which naturalists differ is as to the quantity of spawn from each oyster; some enumerate the young by thousands, others by millions. It is certain enough that the number of young is prodigious—so great, in fact, as to prevent their all being contained in the parent shell at one time. I have examined oyster-spawn (taken direct from the oyster) by means of a powerful microscope, and find it to be a liquid of some little consistency, in which the young oysters, like the points of a hair, swim actively about, in great numbers, as many as a thousand having been counted in a very minute globule of spat. The spawn, as found floating on the water, is greenish in appearance, and each little splash may be likened to an oyster nebula, which resolves itself, when examined by a powerful glass, into a thousand distinct animals.

The oyster, it is now pretty well determined, is not hermaphro-

dite. It is very prolific, as has been already observed, but the enormous fecundity of the animal is largely discounted from their being no security for the spawn which is emitted from oysters falling within the bounds of one's own property, indeed it is too often the case that the spawn falls at a considerable distance from the place where it has been emitted. Thus the spawn from the Whitstable and Faversham Oyster Companies' beds—and these contain millions of oysters—falls usually on a large piece of ground between Whitstable and the Isle of Thanet, formerly common property, but *given* by an Act of Parliament some years since to a company formed for the breeding of oysters. The saving of the spawn cannot be effected unless it falls on proper ground—*i.e.* ground with a shelly bottom is best, for the infant animal is sure to perish if it fall among mud or upon sand; as the first condition of its existence, the infant oyster must obtain a holding-on place.

Oysters have not spawned extensively during late years. The greatest fall of spawn ever known in England occurred fifty-eight years ago. On being exuded from the parental shell, the spawn of the oyster at once rises to the surface, where its vitality is easily affected, and it is often killed in certain places by snow-water or ice. It is thought that not more than one oyster out of each million arrives at maturity! It is curious to note that some oysters have immense shells with very little "meat" in them. I recently saw in a restaurant several oysters, much larger externally than crown-pieces, with the "meat" about the size of a sixpence: these were Firth of Forth oysters from Cockenzie. It is not easy to determine from the external size of the animal the amount of "meat" it will yield—apparently, "the bigger the oyster the smaller the quantity of meat." In the early part of the season only very small oysters used to be sold in Edinburgh—the reason assigned being that all the best dredgers were "away at the herring," and that the persons left behind at the oyster-beds were only able to skim them, so that, for a period of about six weeks, the public obtain only the small fry lying on the top. It is quite certain that as the season advances the oysters obtained are larger and of more decided flavour. In the "natives" obtained at Whitstable the shell and the meat are pretty much in keeping as to size, and this is an advantage.

The Abbé Diquemarc, who has keenly observed the habits of the principal mollusca, assures us that oysters, when free, are

perfectly able to transport themselves from one place to another, by simply causing the sea-water to enter and emerge suddenly from between their valves ; and these they use with extreme rapidity and great force. By means of the operation now described, the oyster is enabled to defend itself from its enemies among the minor crustacea, particularly the small crabs, which endeavour to enter the shell when it is half open. "Some naturalists," the Abbé says, "go the length of allowing the oyster to have great foresight," which he illustrates by an allusion to the habits of those found at the sea-side. "These oysters," he says, "exposed to the daily change of tides, appear to be aware that they are likely to be exposed to dryness at certain recurring periods, and so they preserve water in their shells to supply their wants when the tide is at ebb. This peculiarity renders them more easy of transportation to remote distances than those members of the family which are caught at a considerable distance from the shore."

The secret of their being only a holding-on place required for the spat of the oyster to insure an immensely-increased supply having been penetrated by the French people—and no doubt they are in some degree indebted to our oyster-beds on the Colne and at Whitstable for their idea—the plan of systematic oyster-culture was easy enough, as I will immediately show. A few initiatory experiments, in fact, speedily settled that oysters could be grown in any quantity. Strong pillars of wood were driven into the mud and sand ; arms were added ; the whole was interlaced with branches of trees, and various boughs besides were hung over the beds on ropes and chains, whilst others were sunk in the water and kept down by a weight. A few boat-loads of oysters being laid down, the spat had no distance to travel in search of a home, but found a resting-place almost at the moment of being exuded ; and, as the fairy legends say, "it grew and it grew," till, in the fulness of time, it became a marketable commodity.

But the history of this modern phase of oyster-farming, as practised on the foreshores of France, is so interesting as to demand at my hands a rather detailed notice, for it is one of the most noteworthy circumstances connected with the revived art of fish-culture, that it has resulted in placing upon the shores of France a countless number of fish farms for the cultivation of the oyster alone.

It is no exaggeration to say, that about thirty-seven years ago

there was scarcely an oyster of native growth in France; the beds—and I cite the case of France as a warning to people at home, I mean as regards our Scottish oyster-beds—had become so exhausted from over-dredging as to be unproductive, so far as their money value was concerned, and to be totally unable to recover themselves so far as their power of reproductiveness was at stake. And the people were consequently in despair at the loss of this favourite adjunct of their banquets, and had to resort to other countries for such small supplies as they could obtain. As an illustration of the overdredging that had prevailed, it may be stated that oyster-farms which formerly employed 1400 men, with 200 boats, and yielded an annual revenue of 400,000 francs, had become so reduced as to require only 100 men and 20 boats. Places where at one time there had been as many as fifteen oyster-banks, and great prosperity among the fisher class, had become, at the period alluded to, almost oysterless. St. Brieuc, Rochelle, Marennes, Rochefort, etc., had all suffered so much that those interested in the fisheries were no longer able to stock the beds, thus proving that, notwithstanding the great fecundity of these sea animals, it is quite possible to overfish them, and thoroughly exhaust their productive power.

It was under these circumstances that M. Coste instituted that plan of oyster-culture so much noticed by scientific journals, and which appears to have been inspired by the plan of the mussel-farms in the Bay of Aiguillon, and the oyster-parcs of Lake Fusaro, so far at least as the principle of cultivation is concerned. At the instigation of the French Government, he made a voyage of exploration round the coasts of France and Italy, in order to enquire into the condition of the sea-fisheries, which were, it was thought, in a declining condition. It was his "mission," and he fulfilled it very well, to see how these marine fisheries could be artificially aided, as the fresh-water fisheries had been aided through the re-discovery by Joseph Rémy of the long-forgotten plan of pisciculture, as already detailed in another portion of this work.

The breeding of oysters was a business pursued with great assiduity during what I have called "the gastronomic age" of Italy, the period when Lucullus kept a stock of fish valued at £50,000 sterling, and Sergius Orata invented the art of oyster-culture. There is not a great deal known about this ancient gentleman, except that he was an epicure of most refined taste (the "master of luxury" he was called in his own day), and some

writers of the period thought him a very greedy person, a kind of dealer in shell-fish. It was thought also that he was a house-broker or a man who bought or built houses, and having improved them, sold them to considerable advantage. He received, however, an excellent character, while standing his trial for using the public waters of Lake Lucrinus for his own private use, from his advocate Lucinus Crassus, who said that the revenue officer who prevented Orata was mistaken if he thought that gentleman would dispense with his oysters, even if he was driven from the Lake of Lucrinus, for, rather than not enjoy his molluscous luxury, he would grow them on the tops of his houses.

Lake Fusaro, is highly interesting to all who take an interest in the prosperity of the fisheries, as the first seat of oyster-culture. It is the Avernus of Virgil, and is a black volcanic-looking pool of water, about a league in circumference, which lies between the site of the Lucrine Lake—the lake used by Orata—and the ruins of the town of Cumæ. It is still extant, being even now, devoted to the highly profitable art of oyster-farming, yielding, as has often been published, from this source an annual revenue of about £1200. This classic sheet of water was at one time surrounded by the villas of the wealthy Italians, who frequented the place for the joint benefit of the sea-water baths, and the shell-fish commissariat, which had been established in the two lakes (Avernus and Lucrine). The place, which, before then, was overshadowed by thick plantations, had been consecrated by the superstitious to the use of the infernal gods.

The mode of oyster-breeding at this place, then as now, was to erect artificial pyramids of stones in the water, surrounded by stakes of wood, in order to intercept the spawn, the oyster being laid down on the stones. Faggots of branches were also used to collect the spawn, which within forty-eight hours of its emission, requires to secure a holding-on place or be lost for ever.

FRENCH OYSTER CULTURE.

Costes' plans of oyster culture—Rehabilitation of the beds of St. Brieuc—What was achieved on the Ile De Re—The green oysters of Marennes Dr. Kemmerer's ideas of the best kinds of oyster grounds—Latest statistics of oyster production in France.

THE plan of the Fusaro oyster-breeders struck M. Coste as being eminently practical and suitable for imitation on the coasts of France: he had one of the stakes pulled up, and was gratified to find it covered with oysters of all ages and sizes. The Lake Fusaro system of cultivation was therefore, at the instigation of Professor Coste, strongly recommended for imitation by the French Government to the French people, as being the most suitable to follow, and experiments were at once entered upon with a view to prove whether it would be as practicable to cultivate oysters as easily among the agitated waves of the open sea as in the quiet waters of Fusaro.

In order to settle this point, it was determined to renew the old oyster-beds in the Bay of St. Brieuc, and notwithstanding the fact that the water there is exceedingly deep and the winds very violent, immediate and almost miraculous success was the result. The fascines laid down soon became covered with seed, and branches were speedily exhibited at Paris, and other places, containing thousands of young oysters. The experiments in oyster-culture tried at St. Brieuc were commenced early, on part of a space of 3000 acres that was deemed suitable for the reception of spat. A quantity of breeding oysters, approaching to three millions, was laid down either on the old beds or on newly-constructed longitudinal banks; these were sown thick on a bottom composed chiefly of immense quantities of old shells—the "middens" of Cancale in fact, where the shell accumulation had become a nuisance—so that there was a more than ordinary good chance for the spat finding at once a proper holding-on place. Then again, over some of the new banks, fascines made of boughs tightly tied together were sunk and chained over the beds, so as to intercept such portions of the spawn as were likely, upon rising, to be carried away by the force of the tide. In less than six months the success of the operation in the Bay of St. Brieuc

was assured ; for, at the proper season, a great fall of spawn had occurred, and the bottom shells were covered with the spat, while the fascines were so thickly coated with young oysters that an estimate of 20,000 for each fascine was not thought an exaggeration.

Twelve months, however, before the date of the experiments I have been describing at St. Brieuc, the artificial culture of oysters had successfully commenced on another part of the coast—namely, the Île de Re off the shore of the lower Charente (near la Rochelle), in the Bay of Biscay, which for a time was designated the capital of French oysterdom, having more *parcs* and *claires* than Marennes, Arcachon, Concarneau, Cancale, and all the rest of the coast put together, and which, before it became celebrated for its oyster-growing, was only known, in common with other places in France, for its successful culture of the vine. It is curious to note the rapid growth of the industry of oyster-culture on the Île de Re. It was begun in 1858, and there were, at the time of my enquiry, upwards of 4000 parks and claires upon its shores, where the people may be seen as busy in their fish-parks as the market-gardeners of Kent on their strawberry beds.

Oyster-farming on the Île was inaugurated by one Bœuf, a stone-mason. This shrewd fellow, who was a keen observer of nature, and had seen the oyster spat grow to maturity, began thinking of oyster-culture simultaneously with Professor Coste, and wondering if it could be carried out on those portions of the public foreshore that were left dry by the ebb of the waters. He determined to try the experiment on a small scale, so as to obtain a practical solution of his "idea," and, with this view, he enclosed a small portion of the foreshore of the island by building a rough dyke about eighteen inches in height. In this park he laid down a few bushels of growing oysters, placing amongst them a quantity of large stones, which he gathered out of the surrounding mud. This initiatory experiment was so successful, that in the course of a year he was able to sell £6 worth of oysters from his stock. This result was of course very encouraging to the enterprising mason, and the money was just in a sense found money, for the oysters went on growing while he was at work at his own proper business as a mason. Elated by the profit of his experiment, he proceeded to double the proportions of his park, and by that means more than doubled his oyster commerce, for, in 1861, he was able to dispose of upwards of £20 worth, and this without impoverishing, in the least degree, his breeding

stock. He continued to increase the dimensions of his farm, so that by 1862 his sales had increased to £40. As might have been expected, Bœuf's neighbours had been carefully watching his experiments, uttering occasional sneers, no doubt, at his enthusiasm ; but, for all that, quite ready to go and do likewise whenever the success of the industrious mason's experiments became sufficiently developed to show that they were profitable as well as practical.

After Bœuf had demonstrated the practicability of oyster-farming, the extension of the system over the foreshores of the island between Point de Rivedoux and Point de Lome, was rapid and effective ; so much so that two hundred beds were conceded by the Government previous to 1859, while an additional five hundred beds were speedily laid down, and in 1860 large quantities of brood were sold to the oyster-farmers at Marennes, for the purpose of being manufactured into green oysters in their claires on the banks of the river Seudre. The first sales after cultivation had become general amounted to £126, and the next season the sum reached in sales was upwards of £500, and these monies, be it observed, were for very young oysters ; because, from an examination of the dates, it will at once be seen that the brood had not had time to grow to any great size. So rapid indeed has been the progress of oyster-culture at the Ile de Re, that what were formerly a series of enormous and unproductive mud-banks, occupying a stretch of shore about four leagues in length, are now so transformed, and the whole place so changed, that it seems the work of a miracle. Various gentlemen who have inspected these farms for the cultivation of oysters speak with great hopefulness about the success of the experiment. The late Mr. Ashworth, so well known for his success as a salmon fisher and breeder in Ireland, told me that "oyster-farming on the shores of the French coast is one of the greatest industrial facts of the present age, and will in the end be even more profitable than salmon-breeding." There is only one drawback connected with these and all other sea-farms in France : the farmers I regret to say, are only "tenants at will,"* and liable at any moment to

* Mr. Ashworth, in a communication to Mr. Barry, one of the Commissioners of Irish Fisheries, says—"No charge is made for the oyster-parks, but each plot is marked and defined on a map, and the produce is considered to be the private property of the person who establishes it. They vary in size twenty or thirty yards square, the stone or tiles are placed in rows about five

be ejected ; but notwithstanding this disadvantage the work of oyster-culture still goes bravely forward.

Much hard work had no doubt to be endured before such a scene of industry could be thoroughly organised. When the great success of Bœuf's experiments had been proclaimed in the neighbourhood, a little army of about a thousand labourers came down from the interior of the country and took possession, along with the native fishermen, of the shores, portions of which were conceded to them by the French Government at a nominal rent of about a franc a week, for the purpose of being cultivated as oyster parks and *claires*. The most arduous duty of these men consisted in clearing off the mud, which lay on the shore in large quantities, and which is fatal to the oyster in its early stages ; but this had to be done before the shores could be turned to the purpose for which they were wished. After this preliminary business had been accomplished, the rocks had to be blasted in order to find stones for the construction of the park-walls ; then these had to be built, and the ground had also to be paved in a rough-and-ready kind of way ; foot-roads had also to be arranged for the convenience of the farmers, and carriage-ways had likewise to be made to admit of the progress of vehicles through the different farms. Ditches had to be contrived to carry off the mud ; the parks had to be stocked with breeding oysters, and to be kept carefully free from the various kinds of sea animals that prey upon the oyster ; and many other daily duties had to be performed that demanded the minute attention of the owners. But all obstacles were in time overcome, and some breeders were so very successful as to be offered a sum of £100 for the brood attached to twelve of their rows of stones, the cost of laying these down being about two hundred francs ! To construct an oyster-bed thirty yards square costs about £12 of English money, and it has been calculated that the return from some of the beds has been as high as 1000 per cent ! The whole industry of the Ile is wonderful when it is considered that it was organised in a period of seven years. Except a few privately-kept oysters, there was no oyster establishment on the island previous to 1858.

Some gentlemen from the island of Jersey who visited Re report that an incredible quantity of oysters has been produced on that shore, which a few years ago was of no value, so that this

feet apart, with the ends open so as to admit of the wash of the tide in and out."

branch of industry now realises an extraordinary revenue, and spreads comfort among a large number of families who were previously in a state of comparative indigence. But more interesting even than the material prosperity that has attended the introduction of this industry into the island of Re is the moral success that has accrued to the experiment. Excellent laws have been enacted by the oyster-farmers themselves for the government of the colony. A kind of parliament has been devised for carrying on arguments as to oyster-culture, and to enable the four communities, into which the population has been divided, to communicate to each other such information as may be found useful for the general good of all engaged in oyster-farming. Three delegates from each of the communities are elected to conduct the general business, and to communicate with the Department of Marine when necessary.

A small payment is made by every farmer as a contribution to the general expense, while each division of the community employs a special watchman to guard the crops, and see that all goes on with propriety and good faith; and although each of the oyster-farmers of the Ile de Re cultivates his own park or claire for his own sole profit and advantage, they most willingly obey the general laws that have been enacted for the good of the community. It is pleasant to note this. We cannot help being gratified at the happy moral results of this wonderful industry, and it will readily be supposed that with both vine-culture (for the islanders have fine vineyards) and oyster-culture to attend to, these farmers are kept very busy. Indeed, the growing commerce—the export of the oysters, and the import of other commodities for the benefit of so industrious a population—incidental to such an immense growth of shellfish as can be carried on in the parks and claires which stud the foreground of Re must be arduous; but as the labour is highly remunerative, the labourers have great cause for thankfulness. It is right, however, to state that, with all the care that can be exercised, there is still an enormous amount of waste consequent on the artificial system of culture; the present calculation is, that even with the best possible mode of culture the average of reproduction is as yet only fourteenfold; but it is hoped by those interested that a much larger ratio of increase will be speedily attained. This is desirable, as prices have gone on steadily increasing since the time that Bœuf first experimented. In 1859 the sales were effected at about the rate of fifteen shillings per bushel, for the lowest qualities—the highest

being double that price ; these were for fattening in the claires, and when sold again they brought from two to three pounds per bushel.

One of the most lucrative branches of foreign oyster-farming may be now described—*i.e.*, the manufacture of the celebrated green oysters. The greening of oysters, many of which are brought from the Ile de Re parks, is extensively carried on at Marennnes, on the banks of the river Seudre, and this particular branch of oyster industry, which extends for leagues along the river, and is also sanctioned by free grants from the State, has some features that are quite distinct from those we have been considering, as the green oyster is of considerably more value than the common white oyster. The peculiar colour and taste of the green oyster are imparted to it by the vegetable substances which grow in the beds where it is manipulated. This statement, however, is scarcely an answer to the question of “why,” or rather “how,” do the oysters become green? Some people maintain that the oyster green is a disease of the liver-complaint kind, whilst there are others who attribute the green colour to a parasite that overgrows the mollusc. But the mode of culture adopted is in itself a sufficient answer to the question.

The industry carried on at Marennnes consists chiefly of the fattening in claires, and the oysters operated upon are at one period of their lives as white as those which are grown at any other place ; indeed it is only after being steeped for a year or two in the muddy ponds of the river Seudre that they attain their much-prized green hue. The enclosed ponds for the manufacture of these oysters—and, according to all epicurean authority, the green oyster becomes “*the oyster par excellence*”—require to be water-tight, for they are not submerged by the sea, except during very high tides. Each claire is about one hundred feet square. The walls for retaining the waters require therefore to be very strong ; they are composed of low but broad banks of earth, five or six feet thick at the base and about three feet in height. These walls are also useful as forming a promenade on which the watchers or workers can walk to and fro and view the different ponds. The flood-gates for the admission of the tide require also to be thoroughly water-tight and to fit with great precision, as the stock of oysters must always be kept covered with water ; but a too frequent flow of the tide over the ponds is not desirable, hence the walls, which serve the double purpose of both keeping in and keeping out the water. A trench or ditch is cut in the

inside of each pond for the better collection of the green slime left at each flow of the tide, and many tidal inundations are necessary before the claire is thoroughly prepared for the reception of its stock. When all these matters of construction and slime-collecting have been attended to, the oysters are then scattered over the ground, and left to fatten. When placed in these greening claires they are usually from twelve to sixteen months old, and they must remain for a period of two years at least before they can be properly greened, and if left a year longer they are all the better; for I maintain that an oyster should be at least about four years old before it is sent to table.

In a privately-printed pamphlet on the French oyster-fisheries, sent to me by Mr. Ashworth, it is stated that oysters deposited in the claires for feeding possess the same powers of reproduction as those kept in the breeding ponds. "Their progeny is deposited in the same profusion, but that progeny not coming in contact with any solid body, it inevitably perishes, unless it can attach itself to the vertical sides of some erection." A very great deal of attention must be devoted to the oysters while they are in the greening-pond, and they must be occasionally shifted from one pond to another to ensure perfect success. Many of the oyster-farmers of Marennes have two or three claires suitable for their purpose. The trade in these green oysters is very large, and they are found to be both palatable and safe, the greening matter being furnished by the sea. Some of the breeders, or rather manufacturers, of green oysters, anxious to be soon rich, content themselves with placing adult oysters only in these claires, and these become green in a very short time, and thus enable the operator to have several crops in a year without very much trouble. The claires of Marennes furnishes about fifty millions of green oysters per annum, and these are sold at very remunerative prices, yielding an annual revenue of something like two and a half millions of francs.

As to the kind of ground most suitable for oyster-growth, Dr. Kemmerer, of St. Martin's (Ile de Re), an enthusiast in oyster-culture, gives us a great many useful hints. I have summarised a portion of his information:—The artificial culture of the oyster may be considered to have solved an important question—namely, that the oyster continues fruitful after it is transplanted from its natural abode in the deep sea to the shores. This removal retards but never hinders fecundation. The sea oyster, however, is the most prolific, as the water at a considerable depth

is always tranquil, which is a favourable point in oyster-growth ; but the shore oyster-banks will also be very productive, having two chances of replenishment—namely, from the parent oysters in the *parcs*, and from those currents that may float seed from banks in the sea. Muddy ground is excellent for the *growth* of oysters ; they grow in such localities very quickly, and become saleable in a comparatively short space of time. Dry rock ground is not so suitable for the young oyster, as it does not find a sufficiency of food upon it, and consequently languishes and dies. Marl is the most esteemed, and on it the oyster is said to become perfect in form and excellent in flavour. In the marl the young oyster finds plenty of food, constant heat and perfect quiet. Wherever there is mud and sun there will be found the little molluscs, crustacea, and swimming infusoria, which are the food of the oyster. The culture of the oyster in the mud-ponds and in the marl—a culture which ought some day to become general—changes completely its qualities ; the albumen becomes fatty, yellow or green, oily, and of an exquisite flavour. The animal and phosphorus matter increases, as does the osmozone. This oyster, when fed, becomes exquisite food. In effecting the culture of the sea-shores and of the marl-ponds, I am pursuing a practical principle of great importance, by the conversion of millions of shore oysters, squandered without profit, into food for public consumption. The green oyster, to this day, has only been regarded as a luxury for the tables of the rich ; but as I have indicated, there are an immense number of farms or ponds on the Seudre, and I would like to see it used as food by everyone."

The French oyster-farmers are happy and prosperous. The wives assist their husbands in all the lighter labours, such as separating and arranging the oysters previous to their being placed on the claires. It is also their duty to sell the oysters ; and for this purpose they leave their home about the end of August, and proceed to a particular town, there to await and dispose of such quantities of shell-fish as their husbands may forward to them. In this they resemble the fisherwomen of other countries. The Scotch fishwives do all the business connected with the trade carried on by their husbands ; it is the husband's duty to capture the fish only, and the moment they come ashore their duties cease, and those of their wives and daughters begin with the sale and barter of the fish.

Before going farther, it may be stated that the best mode of

receiving the spawn of the oyster has not been determined. M. Coste, whose advice is well worthy of being followed, recommended the adoption of fascines of brushwood to be fixed over the natural oyster-beds in order to intercept the young ones; others again, as we have just seen, have adopted the *parcs*, and have successfully caught the spawn on dykes constructed for that purpose; but Dr. Kemmerer has invented a tile, which he covers with some kind of composition that can, when occasion requires, be easily peeled off, so that the crop of oysters that may be gathered upon it can be transferred from place to place with the greatest possible ease, and this plan is useful for the transference of the oyster from the collecting *parcs* to the fattening *claire*. The composition and the adhering oyster may all be stripped off in one piece, and the tile may be coated for future use. Tiles are exceedingly useful in aiding the oyster-breeder to avoid the natural enemies of the oyster, which are very numerous, especially at the periods when it is young and tender. The oysters may be peeled off the tiles when they are six or seven months old. Spat-collectors of wood have also been tried with considerable success. Hitherto these tiles have been very successful, although it is thought by experienced breeders that no bottom for oysters is so good as the natural one of "cultch," as the old oyster-shells are called, but the tile is often of service in catching the "floatsome," as the dredgers call the spawn, and to secure that should be one of the first objects of the oyster-farmer.

We glean from these proceedings of the French pisciculturists the most valuable lessons for improvement and conduct of British oyster-parks. If each matured oyster yields about a million of young per annum, and if the greater proportion of these can be saved by being afforded a permanent resting-place, it is clear that, by laying down a few thousand breeders, we may, in the course of a year or two, have, at any place we wish, a large and productive oyster-farm.

With reference to the question of growth, Coste tells us that stakes which had been fixed for a period of thirty months in the lake of Fusaro were quite loaded with oysters when they came to be removed. These were found to embrace a growth of three seasons. Those of the first year's spawning were ready for the market; the second year's brood were a good deal smaller; whilst the remainder were not larger than a lentil. To attain miraculous crops similar to those once achieved in the Bay of

St. Brieuc, or at the Ile de Re, little more is required than to lay down the spawn in a nice rocky bay, or in a place paved for the purpose, and having as little mud about it as possible. A place having a good stream of water flowing into it is the most desirable, so that the flock may procure food of a varied and nutritious kind. A couple of hundred stakes driven into the soft places of the shore, between high and low water mark, and these well supplied with branches held together by galvanised iron wire (common rope might soon become rotten), would, in conjunction with the rocky ground, afford capital holding-on places, so that any quantity of spawn might, in time, be developed into fine "natives." There are hundreds of places on the English and Irish coasts where such farms could be advantageously laid down.

The foregoing details may be supplemented as follows :—The number of *parcs* conceded at Arcachon in 1865 was 297, but in the year 1880, that number had increased to 4,259, whilst the number of single oysters exported in the season named [1880] was 195,477,357, representing a value of 4,254,466 francs, or £177,269 sterling,—the mean price per thousand being 25 francs, or about half the price of the years 1870-2. These results namely, the plentifulness and cheapness, have, it is affirmed, resulted from the introduction of large supplies of Oysters from Portugal.

Interesting statistics have been published, regarding the progress of Oyster culture at another place of production, namely the Oyster cultural basin of Auray, which has been going on for a period of sixteen years, and the beds of which are at present in a state of decadence, having fallen from a take of 27,145,000 in 1878, to a take of 11,064,000 only in the year 1881. These figures refer to the Auray and tributaries, but a similar falling off occurs in the district of La Trinite River. These figures, however, must be taken for what they are worth, as in other parts of the same report it is mentioned that the number of marketable Oysters exported was 33,325,000. It may be taken, I fancy, that the first set of figures refers only to the public Oyster beds, while the latter numbers refer to the total production, public and private.

The following note from a report of what has been done at Marennes, is extracted from a report on the condition of Oyster culture in France in 1881, by Dr. P. Brocchi :—"The number of Oysters introduced at Marennes, was one hundred and

ninety million, of which one hundred and thirty million were placed in the live boxes and depots, and sixty million were placed in the claires. Of the one hundred and thirty million in the rivers, about forty million were Portuguese, and about ninety million French. The exportation of Oysters from the place amounted to one hundred and fifty one million. Of the number, fifty four million Portuguese, and forty seven million French, came from the depots and rivers, and fifty million came from the claires.

A great amount of the miscellaneous information regarding oyster-growth and oyster-commerce, which has been circulated during the last fifteen years, is not of a reliable nature ; but many of the circumstances attendant on artificial culture are interesting, and have been proved to be correct, although they seem contradictory ; as, for instance, that oysters if spawned on a muddy bottom are lost, although the same muddy bottom is highly suitable for the feeding stages of the mollusc. It is also remarkable that breeding oysters do not fatten, and that fat oysters are slow to yield *spat*. There has been some controversy as to whether transplanted oysters will breed ; opinions differ, and it is on record that such a remarkable spat once fell on the Whitstable grounds as to provide a stock for eleven years, including, of course, what was gathered towards the end of that period. A close time for oysters is a law of the land ; but for all that we have oysters all the year round, because all oysters do not sicken or *spat* at the same period ; in fact the economy of fish growth is not yet understood either by naturalists or fishermen ; as an instance of mal-economy we have salmon rivers being remarkable for early spawning fish, whilst others are equally so for the tardiness with which their scaly inhabitants repeat the story of their birth. In time, when we understand better how to manage our fisheries, the supplies of all kinds of round and shell fish will doubtless be better regulated than at present.

ECONOMY OF AN OYSTER-FARM.

English Oyster Farms—Whitstable—Pont Oyster-Grounds—Price of Brood
 —“Natives”—Colne Oyster-Beds—Cost of Working the Beds—
 Increase of the Oyster—Demand for the Bivalve—Collecting for the
 Beds—Newhaven Oyster-Beds—The “Whisker’d Pandore”—Song of
 the Dredger—Oysters in America.

A LARGE oyster-farm requires a great deal of careful attention, and several people are necessary to keep it in order. If the farm be planted in a bay where the water is very shallow, there is great danger of the stock suffering from frost; and again, if the brood be laid down in very deep water, the oysters do not fatten or grow rapidly enough for profit. In dredging, the whole of the oysters, as they are hauled on board, should be carefully examined and picked; all below a certain size ought to be returned to the water till their beards have grown large enough. In winter, if the beds be in shallow water, the tender brood must be placed in a pit for protection from the frost; which of course takes up a great deal of time. Dead oysters ought to be carefully removed from the beds. The proprietors of private “layings” are generally careful on this point, and put themselves to great trouble every spring to lift or overhaul all their stock in order to remove the dead or diseased. Mussels must be carefully rooted out from the beds; otherwise they would in a short time render them valueless. The layings, for example, of Mr. David Plunkett, in Killhery Bay, for which he had a license from the Irish Board of Fisheries, were overrun by mussels, and so rendered almost valueless. The weeding and tending of an oyster-bed requires, therefore, much labour, and involves either a partnership of several people—which is usual enough, as at Whitstable—or at least the employment of several dredgermen and labourers. But, for all that, an oyster-farm may be made a most lucrative concern.

As a guide to the working of a very large oyster farm—say a concern of £70,000 a year or thereabout—I shall give immediately some data of the Whitstable Free Dredger’s Company: but I wish first to say that the organisation which is now working for supplying the great metropolis with oysters is more

perfect than can be said of any other branch of the fish trade. In oyster-culture we approach in some degree to the French, although we do not, as they do, except as regards some new companies, begin at the beginning and plant the seed. All that we have yet achieved is the act of nursing the young "brood," and of dividing and keeping separate the different kinds of oysters. This is done in parks or farms on various portions of the coasts of Kent and Essex, and the whole process, from beginning to end, may be viewed at Whitstable, where there is a large oyster-ground and a fine fleet of boats kept for the purpose of dredging and planting. The Whitstable oyster-beds are held as by a joint-stock company, into which, however, there is no other way of entrance except by birth, as none but the free dredgemen of the town can hold shares. When a man dies his interest in the company dies with him, but his widow—if he was a married man—obtains a pension. The sales from the public and private beds of Whitstable have sometimes attained a total of £200,000 per annum. The business of the company is managed by twelve directors, who are known as "the Jury." The stock of oysters held in the private layings of the company is said to be of the value of £200,000. The extent of the public and other oyster-ground at Whitstable is about twenty-seven square miles.

The oyster-farm of Whitstable is a co-operation in the best sense of the term, and has been in existence for a long period: it is the wealthiest and largest oyster corporation in the world. The layings at Whitstable occupy about a mile and a half square, and the oyster-beds there have been so very prosperous as to have attained the name of the "happy fishing-grounds." At Whitstable, Faversham, and adjoining grounds, a space of twenty-seven square miles, as I have mentioned above, is taken up in oyster-farms, and the industry carried on in this space of ground involves the annual earning and expenditure of a very large sum of money. Over 3000 people are employed in the various industries connected with the fishery, who earn capital wages all the year round—the sum paid for labour by the different companies being set down at over £160,000 per annum; and in addition to this expenditure for wages, there is likewise a large sum of money annually expended for the repairing and purchasing of boats, sails, dredges, and other implements used in oyster-fishing.

At Whitstable the course of work is as follows:—The business of the company is to feed oysters for the London and other markets: for this purpose they buy brood or spat, and lay it down in their

beds to grow. When the company's own oysters produce a spat—that is, when the spawn or “floatsome” as the dredgers call it, emitted from their own beds falls upon their own ground—it is of great benefit to them, as it saves purchases of brood to the extent of what has fallen; but this falling of the spat is in a great degree accidental, for no exact rule can be laid down as to when the oysters spawn or where the spat may be carried to. No artificial contrivances of the kind known in France have yet been used in Whitstable for the saving of the spawn. Very large sums have been paid in some years by the Whitstable company for brood with which to stock their grounds, great quantities being collected from the Essex side, there being a number of people who derive a comfortable income from collecting oyster-brood on the public foreshores, and disposing of it to persons who have private nurseries, or “oyster-layings” as these are locally called. The grounds of Pont are particularly fruitful in spat, and yield large quantities to all that require it. Pont is an open space of water, sixteen miles long by three broad, free to all; about one hundred and fifty boats, each with a crew of three or four men, find constant employment upon it, in obtaining young oysters, which they sell to the neighbouring oyster-farmers, although it is certain that the brood thus freely obtained must have floated out of beds belonging to the purchasers. The price of brood is often as high as fifty shillings per bushel, and it is the sum obtained over this cost price that must be looked to for the paying of wages and the realisation of profit. Oysters have risen in price very much of late years, and brood has also, in consequence of the scarcity of spat, been proportionally high.

Whitstable oyster-beds are “worked” with great industry, and it is the process of “working” that gives employment to so many people (eight men per acre are employed), and improves the Whitstable oysters so much beyond those found on the natural beds, which are known as “Commons,” in contradistinction to the bred oysters of Whitstable and other grounds, which are called “Natives.” These latter are justly considered to be of superior flavour, although no particular reason can be given for their being so, and indeed in many instances they are not natives at all—that is in the sense of being spat on the ground—but are, on the contrary, a grand mixture of all kinds of oysters, brood being brought from Prestonpans and Newhaven in the Firth of Forth, and from many other places, to augment the stock. The so-called “native” oysters—and the name is

usually applied to all that are bred in the estuary of the Thames—are, in a comparative sense, very large in flesh, succulent and delicate in flavour, and fetch a much higher price than any other oyster. The beds of natives are all situated on the London clay, or on similar formations. There can, however, be no doubt that the difference in quality and quantity of flesh is obtained by the Thames system of transplanting and working that is vigorously carried on over all the beds. Every year the whole extent of the layings is gone over and examined by means of the dredge; successive portions are dredged over day by day, till it may be said that almost every individual oyster is examined. On the occasion of these examinations, the brood is detached from the cultch, double oysters are separated, and all kinds of enemies—and these are very numerous—are seized upon and killed. It requires about eight men per acre to work the beds effectually. During three days a week, dredging for what is called the “planting” is carried on; that is, the transference of the oysters from one place to another, as may be thought suitable for their growth, and also the removing of dead ones, the clearing away of mussels, and so on. On the other three days of the week it becomes the duty of the men to dredge for the London market, when only so many are lifted as are required. A bell is carried round and rung every morning to rouse the dredgers whose turn it is for duty, and who at a given signal start to do their portion of the “stint.” As to this working of the oyster-beds, an eminent authority has said it is utterly useless to enclose a piece of ground and simply plant it; it is utterly useless to throw a lot of oysters down amongst every state of filth. You must keep constantly dredging, not only the bed itself, but the public beds outside, so as to keep the bottom fit for the reception and growth of the young oysters, and free of its multitudinous natural enemies.

It may as well be explained here also, that what are called native beds are all cultivated beds; the natural beds are uncultivated, and are generally public and free to all comers. The Colne beds, however, are an exception: they are natural beds, but are held by the City of Colchester as property. Whenever a new bed is discovered anywhere nowadays, the run upon it is so great that it is at once despoiled of its shelly treasures; and the native beds would soon become exhausted if they were not

systematically conducted on sound commercial principles, and regularly replenished with brood.

As regards the oyster-cultivation of the river Colne, some interesting statistics were some years ago made public at Colchester by the late Councillor Hawkins. That gentleman told us that oyster-brood increases fourfold in three years. The quantity of oysters in a London bushel is as follows :—First year, *spat*, number not ascertainable ; second year, *brood*, 6400 ; third year, *ware*, 2400 ; fourth year, *oysters*, 1600 ; therefore, four wash of brood (*i.e.*, four pecks), purchased at say 5s. per wash, increase by growth and corresponding value to 42s. per bushel, or a sum of eight guineas. The quantity of oysters obtained from the river Colne by the company bears but a small proportion to the yield from private layings, which are in general only a few acres in extent. “The private layings,” however, we are told, “cannot fairly be made the measure of productiveness for a large fishery ; as they may be compared to a garden in a high state of cultivation, while the fishery generally is better represented by a large tract of land but partially reclaimed from a state of nature.” The difference in cost of working a big fishery and a little one seems to be great. One of the owners of a private laying states that, when the expense of dredging or lifting the oysters exceeded 4s. per bushel, he gave up working, while in the Colne Fishery dredgermen are never paid less than 12s., and sometimes as high as 40s. a bushel. The Colne Company is managed by a jury of twelve, appointed by the water-bailiff, who is under the jurisdiction of the corporation of Colchester. Whenever it is time to begin the season’s operations, the jury meet and take stock of the oysters on hand, fix the price at which sales are to be made, and regulate the charge for dredging, which is paid by the wash. Under direction of the jury, the foreman of the company sets the daily stint to the men ; and so the work, which is very light, goes pleasantly forward from season to season.

At Faversham, Queenborough, and Rochester, there is a large commerce carried on in this particular shell-fish. In others of the “parks” at these places, “natives” are grown in perfection. The company of the burghers of Queenborough grow the fine Milton oyster so well known to the connoisseur, and the company’s beds are well attended to. I may note the Faversham Company, said to be the oldest among the Thames companies, having been in existence for a few centuries. All

of these companies grow "natives," and I may explain that the portion of the beds set apart for the rearing of "natives" is as sacred as the waxen cells devoted to the growth of queen bees, and the coarser denizens of the mid-channel are not allowed to be mixed therewith. The management of all the Kent and Essex oyster companies is pretty much the same, but there are also gentlemen who trade solely upon their own account.

The demand for native and other oysters by the Londoners alone is something wonderful, and constitutes of itself a large branch of commerce—as the numerous shell-fish shops of the Strand and Haymarket abundantly testify. It is not easy to arrive at correct statistics of what London requires in the way of oysters; but if we set the number down as being nearly 1,000,000,000 per annum we shall not be very far wrong. To provide these, the dredgermen or fisher people at Colchester, and other places on the Essex and Kent coasts, prowl about the sea-shore and pick up all the little oysters they can find—these ranging from the size of a threepenny-piece to a shilling; and persons and companies having layings purchase them to be nursed and fattened for the table, as already described. At other places the spawn itself is collected, by picking it from the pieces of stone, or the old oyster-shells, to which it may have adhered; and it is sold to the Whitstable people, who carefully lay that brood in their grounds. A good idea of the oyster-traffic may be obtained from the fact that, in some years, the Whitstable men have paid £30,000 for brood in order to keep up the stock of their far-famed oysters.

The centre in England for the distribution of oysters is Billingsgate, the chief piscatorial bourse of the great metropolis, and the countless thousands of bushels of this molluscos dainty which find their way through "Oyster Street" to this Fish Exchange mark the everlasting demand. Oysters are sold by the bushel, and every measure is made to pay a toll of fourpence and another sum of a like amount for carriage to the shore. All oysters sold at Billingsgate are liable to this eightpenny tax. The London oysters—and I regret to say it, for there is nothing finer than a genuine oyster—are sophisticated in the cellars of the buyers, by being stuffed with oatmeal till the flavour is all but lost in the fat. The flavour of oysters—like the flavour of all other animals—depends on their feeding. The fine *gout* of the highly-relished Prestonpans oysters is said to be derived from the fact of their

feeding on the refuse liquor which flows from the saltpans of that neighbourhood. I have eaten of fine oysters taken from a bank that was visited by a rather questionable stream of water; they were very large, fat, and of exquisite flavour, the shell being more than usually well filled with "meat." What the London oysters gain in fat by artificial feeding they assuredly lose in flavour. The harbour of Kinsale (a receptacle for much filth) used to be remarkable for the size and flavour of its oysters. The beds occupied the whole harbour, and the oysters there were at one time very plentiful, and far exceeded the Cork oysters in fame (and they have long been famous); but they were so over-fished as to be long since used up, much to the loss of the Irish people, who are particularly fond of oysters, and delight in their "Pooldoodies" and "Red-banks" as much as the English and Scotch do in their "Natives" and "Pandores."

The far-famed Scottish oysters obtained near Edinburgh, once so cheap, have become of late scarce and dear. The growth of the railway system has also extended the Newhaven men's market. Before the railway period very few boats went out at the same time to dredge; then oysters were very plentiful—so plentiful, in fact, that three men in a boat could, with ease, procure 3000 oysters in a couple of hours; but now, so great is the change in the productiveness of the scalps, that three men consider it an excellent day's work to procure about a fifth part of that quantity. The Newhaven oyster-beds lie between Inchkeith and Newhaven, and belong to the city of Edinburgh, and were given in charge to the free fishermen of that village, on certain conditions.

The "pandore" oysters are principally obtained at the village of Prestonpans and the neighbouring one of Cockenzie. Dredging for oysters is a principal part of the occupation of the Cockenzie fishermen. There are few lovers of this dainty mollusc who have not heard of the "whiskered pandores." It is a large fine-flavoured oyster, as good as any "native" that ever was brought to table, the Pooldoodies of Burran not excepted. The men of Cockenzie used to derive a good portion of their annual income from the oyster traffic. The pursuit of the oyster, indeed, forms a phase of fisher life there as distinct as at Whitstable. The times for going out to dredge are at high tide and low tide. The boats used are the smaller-sized ones employed in the white fishery. The dredge somewhat resembles in shape a common clasp-purse; it is formed of net-

work, attached to a strong iron frame, which serves to keep the mouth of the instrument open, and acts also as a sinker, giving it a proper pressure as it travels along the oyster-beds. When the boat arrives over the oyster-scalps, the dredge is let down by a rope attached to the upper ring, and is worked by one man, except in cases where the boat has to be sailed swiftly, when two are employed. Of course, in the absence of wind recourse is had to the oars. The tension upon the rope is the signal for hauling the dredge on board, when the entire contents are emptied into the boat, and the dredge returned to the water. These contents, not including the oysters, are of a most heterogeneous kind—stones, sea-weed, star-fish, young lobsters, crabs, actinæ—all of which are usually returned to the water, some of them being considered as the most fattening ground-bait for the codfish. The whelks, clams, mussels, cockles, and occasionally the crabs are used by the fishermen as bait for their white-fish lines. Once, in a conversation with a veteran dredger as to what strange things *might* come in the dredge, he replied, "Well, master, I don't know what sort o' curiosities we sometimes get ; but I have seen gentlemen like yourself go out with us a-dredgin', and take away big baskets full o' things as was neither good for eating or looking at. The Lord knows what they did wi' them." During the whole time that this dredging is being carried on, the crew keep up a wild monotonous song, or rather chant, in which they believe much virtue to lie. They assert that it charms the oysters into the dredge.

" The herring loves the merry moonlight,
The mackerel loves the wind ;
But the oyster loves the dredger's song,
For he comes of a gentle kind."

Talking is strictly forbidden, so that all the required conversation is carried on after the manner of the *recitative* of an opera or oratorio. An enthusiastic London *litterateur* and musician, being on a visit to Scotland, determined to carry back with him, among other natural curiosities, the words and music of the oyster-dredging song. But after being exposed to the piercing east wind for six hours, and jotting down the words and music of the dredgers, he found it all to end in nothing ; the same words were never used, the words were ever changing. The oyster-scalps are gone over by the men much in the way that a field is ploughed by an agricultural labourer, the boat going and

returning until sufficient oysters are secured, or a shift is made to another bed.

The geographical distribution of oysters is most lavish; wherever there is a seaboard there will they be found. The old stories of ancient mariners, who sailed the seas before the days of cheap literature, will be recalled, and their boasted knowledge of the wonders of the fish world—of oysters that grew on trees, and oysters so large that they required to be carved just like a round of beef or quarter of lamb. All these tales were formerly considered so many romances. Who believed Uncle Jack when he gravely told his wondering nephews about oysters as large as a soup-plate being found on the coast of Coromandel. But, nevertheless, Uncle Jack's stories have been found to be true: there *are* large oysters which require carving, and oysters *have* been plucked off trees. There are wonderful tales about oysters that have been taken on the coast of Africa—plucked too from the very trees that our good, but ignorant, forefathers did not believe in. The ancient Romans, who knew all the secrets of good living, had the oysters of all countries brought to their fish-stews, in order that they might experiment upon them and fatten them for table purposes. Although they gave the palm to those from Britain, they had a great many varieties from Africa, and had ingenious modes of transporting them to great distances which have been lost to modern pisciculturists.

In America the oyster is an institution of great importance. On the seaboard of that vast continent they are found in natural beds of wonderful extent, and are distributed by means of railway and steamboat throughout the cities and villages of even the far inland districts. Numerous as are the shell-fish shops of London, they are but as one in ten when compared with the oyster-houses of New York, in which city oyster-eating appears to be almost the sole business of life, so many people are to be found indulging in that pleasure. The custom in America is to have the oysters cooked, and this culinary process is accomplished in a variety of ways; the mollusc being stewed, fried, or roasted, according to taste; they may be cooked in about twenty different ways in any of the well-known oyster taverns of New York at a few minutes' notice.

The great market for oysters in America is the city of Baltimore, in Maryland, where it is not uncommon for one or two firms each to "can" a million bushels in one year. Immense numbers of these "canned" oysters are dispatched all over the

States, to the prairies of the far west, to the cities of New Mexico, to the military forts of the great American desert, to the restaurants of Honolulu, and to the miners searching for gold on the Rocky mountains; whilst fresh oysters packed in ice have been sent to great distances. In the oyster-fisheries of Maryland as many as six hundred vessels of about twenty-three tons each are engaged, in addition to two thousand small boats or canoes. These employ about seven thousand men, and if we add those engaged in the carrying trade, it would give the number of persons employed in the oyster trade of the State of Maryland as at least ten thousand, all obtaining remunerative employment.

In order to give my readers an idea of the extent of the American Oyster industry, I quote from Ingersoll's work the following figures :—

| | | | | |
|-------------------------------|---|---|---|---------------|
| Number of Persons employed, | - | - | - | 52,805. |
| Bushels of Oysters gathered, | - | - | - | 22,195,370. |
| Value of Oysters sold, | - | - | - | \$13,438,852. |
| Capital Invested in Industry, | - | - | - | \$10,583,295. |
| Number of Boats engaged, | - | - | - | 4,155. |

Counting the Oysters individually, it has to be stated, on the authority of Professor Brown Goode, that the annual yield may be set down at 5,550,000,000. Molluscs—Canada provides 22,000,000 every year, making a total for America of 5,572,000,000, or about double the quantity yielded by all the Oyster fisheries of Europe, as denoted by the following figures, taken from Professor Goode's article in the *Encyclopædia Britannica* :—

| | | | | | | |
|----------------|---|---|---|---|---|----------------|
| Great Britain. | - | - | - | - | - | 1,600,000,000. |
| France, | - | - | - | - | - | 680,400,000. |
| Holland, | - | - | - | - | - | 21,800,000. |
| Italy, | - | - | - | - | - | 20,000,000. |
| Germany, | - | - | - | - | - | 4,000,000. |
| Belgium, | - | - | - | - | - | 2,500,000. |
| Spain, | - | - | - | - | - | 1,000,000. |
| Portugal, | - | - | - | - | - | 800,000. |
| Denmark, | - | - | - | - | - | 200,000. |
| Russia, | - | - | - | - | - | 250,000. |
| Norway, | - | - | - | - | - | 250,000. |

representing a grand total of 2,331,200,000, which, if taken as being of the value of one halfpenny each over head amounts to a sum of £4,856,666.

Large supplies of American Oysters continue to be imported into Europe both for immediate consumption and for laying down till wanted. Our share of the imported molluscs reached

nearly 100,000 barrels in the season 1884-5, the whole coming to hand in fairly good condition, and if it had not been for the aid afforded us in this direction by America, our Oyster supplies would have proved utterly inadequate to the local demand, with the result of still further enhancing the price of the few which were brought to market.

It is said that better days are again about to dawn on Oyster eaters, and that the *spat* of 1880-1 has turned out very productive—let us hope that this good news is true.

OUR SHELL-FISH FISHERIES.

Productive Power of Shell-Fish—Varieties of the Crustacean Family—Study of the Minor Shell-Fishes—Demand for Shell-Fish—Lobsters—A Lobster Store-Pond described—Natural History of the Lobster and other Crustacea—March of the Land-Crabs—Prawns and Shrimps, how they are caught and cured.

SHELL-FISH is the popular name bestowed by unscientific persons on the Crustacea and Mollusca, and no other designation could so well cover the multitudinous variety of forms embraced in these extensive divisions of the animal kingdom. Fanciful disquisitions on shell-fish and on marine zoology have been intruded on the public of late till they have become somewhat tiresome; but as our knowledge of the natural history of all kinds of sea animals, and particularly of oysters, lobsters, crabs, etc., is decidedly on the increase, there is room for all that I have to say on the subject of these dainties, although there are still unexplored wonders of animal life in the fathomless sea that deserves the deepest study.

The economic and productive phases of our shell-fish fisheries have never yet, in my opinion, been sufficiently discussed; and when I state that the power of multiplication possessed by all kinds of Crustacea and Mollusca is, speaking roundly, as great as that possessed by finned fishes, it will be obvious that there is much in their natural history that must prove interesting even to the most general reader. Each oyster gives birth to incredible quantities of young. Lobsters also have an amazing fecundity, and yield an immense number of eggs—each female producing from twelve to twenty thousand in a season; and the crab is likewise most prolific. I once purchased a crab weighing within an ounce of two pounds, and it contained a mass of minute eggs equal in size to a man's hand; these were so minute that a very small portion of them, picked off with the point of a pin, when placed on a bit of glass, and counted by the aid of a powerful microscope, numbered over sixty, each appearing of the size of a red currant, and not at all unlike that fruit: so far as I could guess the eggs were not nearly ripe. I have seen it stated that a female crab will yield a million ova. I also exam-

ined about the same time a quantity of shrimp-eggs; and it is curious that, while there are the cock and hen lobster, I never saw any difference in the sex of the shrimps: all that I handled, amounting to hundreds, were females, and all of them were laden with spawn, the eggs being so minute as to resemble grains of fine sand.

Although the crustacean family counts its varieties by thousands, and contains members of all sizes, from minute animalculæ to gigantic American crabs and lobsters, and ranges from the simplest to the most complex forms, yet the edible varieties are not at all numerous. The largest of these are the lobster (*Astacus marinus*) and the crab (*Cancer pagurus*); and river and sea cray-fish may also be seen in considerable quantities in London shell-fish shops; and as for common shrimps (*Crangon vulgaris*) and prawns (*Palæmon serratis*), they are eaten in myriads. The violet or marching crab of the West Indies, and the robber crab common to the islands of the Pacific, are also esteemed as great delicacies of the table, but are unknown in this country except by reputation.

Leaving old and grave people to study the animal economy of the larger Crustacea, the juveniles may with advantage take a peep at the periwinkles, the whelks, or other Mollusca. These are found in immense profusion on the little stones between high and low water mark, and on almost every rock on the British coast. Although to the common observer the oyster seems but a repulsive mass of blubber, and the periwinkle a creature of the lowest possible organisation, nothing can be farther from the reality. There is throughout this class of animals a wonderful adaptability of means to ends. The turbinated shell of the periwinkle, with its finely-closed door, gives no token of the powers bestowed upon the animal, both as provision for locomotion (this class of travellers wherever they go they carry their house along with them) and for reaping the tender rock-grass upon which they feed. They have eyes in their horns, and their sense of vision is quick. Their curiously-constructed foot enables them to progress in any direction they please, and their wonderful tongue either acts as a screw or a saw. In fact, simple as the organisation of these animals appears to be, it is not less curious in its own way than the structure of other beings which are thought to be more complicated. In good truth, the common periwinkle (*Littorina*

vulgaris) is both worth studying and eating, vulgar as some people may think it.

Immense quantities of all the edible molluscs are annually collected by women and children in order to supply the large inland cities. Great sacks full of periwinkles, whelks, etc., are sent on by railway to Manchester, Glasgow, London, etc.; whilst on portions of the Scottish sea-coast the larger kinds are assiduously collected by the fishermen's wives and prepared as bait for the long hand-lines which are used in capturing the codfish or other Gadidæ. As an evidence of how abundant the sea-harvest is, I may mention that from a spot so far north as Orkney thousands of bags of periwinkles are yearly sent to London by the Aberdeen steamer. These quantities are the fruit of never ending labour, labour which is but scantily remunerated.

From personal inquiry made by the writer he estimated that for the commissariat of London alone there were required three millions of crabs and lobsters! May we not, therefore, take for granted that the other populous towns of the British empire will consume an equally large number? The people of Liverpool, Manchester, Edinburgh, Glasgow, and Dublin, are as fond of shell-fish as the denizens of the great metropolis; at any rate they eat all they can get, and never get enough. The machinery for supplying this ever-increasing demand for lobsters, crabs, and oysters, is exceedingly simple. On most parts of the British coast there are people who make it their business to provide those luxuries of the table for all who wish them. The capital required for this branch of the fisheries is not large, and the fishermen and their families attend to the capture of the crab and lobster in the intervals of other business.

The Scotch laird's advice to his son to "be always stickin' in the ither tree, it will be growin' when ye are sleepin'," holds good in lobster fishing. The pots may be baited and left till such time as the victim enters, whilst the men in the meantime take a short cruise in search of bait, or try a cast of their haddock-lines a mile or two from the shore; or the fishing can be watched over, and when the lobsters are numerous, the pots be lifted every half-hour or so. The taking of shell-fish also affords occupation to the old men and youngsters of the fishing villages, and these folks may be seen in the fine days assiduously waiting on the lobster-traps and crab-cages, which are not unlike overgrown rat-traps, and are constructed of netting fastened over a wooden framework, baited with any kind of fish offal, or garbage, the stench of which may

be strong enough to attract the attention of those minor monsters of the deep. A great number of these lobster-pots are sunk at, perhaps, a depth of twelve or twenty fathoms at an appropriate place, being held together by a strong line, and all marked with a peculiarly-cut piece of cork, so that each fisherman may recognise his own lot. The knowing youngsters of our fishing communities can also secure their prey by using a long stick. Mr. Cancer Pagurus is watched as he bustles out for his evening promenade, and, on being deftly pitched upon his back by means of a pole, he indignantly seizes upon it with all his might, and the stick being shaken a little has the desirable effect of causing Mr. Crab to cling thereto with great tenacity, which is, of course, the very thing desired by the grinning "human" at the other end, as whenever he feels his prey secure he dexterously hauls him on board, unhooks the crusty gentleman with a jerk, and adds him to the accumulating heap at the bottom of the old boat. The monkeys in the West Indies are, however, still more ingenious than the "fisher loons" of Arran or Skye. Those wise animals, when they take a notion of dining on a crab, proceed to the rocks, and slyly insinuating their tail into one of the holes where the crustacea take refuge, that appendage is at once seized upon by the crab, who is thereby drawn from his hiding-place, and, being speedily dashed to pieces on the hard stone, affords a fine feast to his captor. This reminds me of the story told about a man's dog which was seized by a crab when passing a fish shop: *Punch* had it, "Whistle on your dog man;" "Na, na, my man; whistle you on your partan."

On the granite-bound coast of Scotland the sport of crab-hunting may be enjoyed to perfection, and the wonders of the deep be studied at the same time. A long pole with a small crook at the end will be found useful to draw the crab from his nest, or great fun may be enjoyed by tying during low-water a piece of bait to a string and attaching a stone to the other end of the cord. The crab seizes upon this bait whenever the tide flows, and drags it to its hole, so that when the ebb of the tide recurs, the stone at the end of the cord marks the hiding-place of the animal, who thus falls an easy prey to his captor. The natives are the best instructors in these arts, and seaside visitors cannot do better than engage the services of some strong fisher youth to act as guide in such perambulations as they may make on the beach. There are few seaside places where the natives cannot guide strangers to rock pools and picturesque

nooks teeming with materials for studying the wonders of the shore.

Lobsters are collected and sent to London from all parts of the Scottish shore. I have seen on the Sutherland and other coasts perforated floating chests filled with them. They were kept till called for by the welled smacks, which generally make the circuit of the coasts once a week, taking up all the lobsters or crabs they can get, and carrying them alive to London. From the Durness shores alone as many as from six to eight thousand lobsters have been collected in the course of a single summer, and sold, big or little, at threepence each to the buyers. The lobsters taken on the north-east coast of Scotland and at Orkney are now packed in seaweed and sent in boxes to London by railway. Lobsters have not been so plentiful, it is thought, in the Orkney Islands of late years; but a large trade has been done in them since the railway was opened from Aberdeen—at all events, the prices of lobsters are double what they used to be in the time of the welled smacks alluded to above. The fisher-folks of Orkney confess that the trade in lobsters pays them well. At some places in Scotland lobster-fishing is pursued at great risk. Among the groups of rocky islands on the west coast of Scotland, it is often a work of great danger to set the lobster-pots, and often enough after being set they cannot again be reached, in consequence of sudden squalls, till many days have elapsed; so that, if the remuneration for the labour is good, it is sometimes very hardly earned.

All kinds of crustaceans can be kept alive at the place of capture till “wanted”—that is, till the welled vessel which carries them to London or Liverpool arrives—by simply storing them in a large perforated wooden box anchored in a convenient place. Nor must it be supposed that the acute London dealers allow too many lobsters to be brought to market at once; the supply is governed by the demand, and the stock kept in large store-boxes at convenient places down the river, where the seawater is strong and the liquid filth of London harmless. But these old-fashioned store-boxes will, no doubt, be speedily superseded by the construction of artificial store-ponds on a large scale, similar to that erected by Mr. Scovell at Hamble, near Southampton. That gentleman's pond has been of good service to him. It is about fifty yards square, and is lined with brick, having a bottom of concrete, and was excavated at a cost of about £1200. It will store with great ease 50,000 lobsters, and

the animals may remain in the pond as long as six weeks, with little chance of being damaged. Lobsters, however, do not breed in this state of confinement, nor have they been seen to undergo a change of shell. There is, of course, an apparatus of pipes and sluices for the purpose of supplying the pond with water. The stock is recruited from the coasts of France and Ireland; and to keep up the supply Mr. Scovell has in his service two or three vessels of considerable size, which visit the various fisheries and bring the lobsters to Hamble in their capacious wells, each of which is large enough to contain from 5000 to 10,000 animals.

The west and north-west coasts of Ireland abound with fine lobsters, and welled vessels bring thence supplies for the London market, and it is said that a supply of 10,000 a week can easily be obtained. Immense quantities are also procured on the west coast of Scotland. I saw once on board a steamboat at Greenock a cargo of 30,000 lobsters, obtained chiefly on the coasts of Lewis and Skye. The value of these to their captors would be upwards of £1000, and in the English fishmarkets the lot would bring at least four times that sum.

A very large share of our lobsters is derived from Norway, as many as 30,000 sometimes arriving from the fjords in a single day. The Norway lobsters are much esteemed, and we pay the Norwegians something like £20,000 a year for this one article of commerce. They are brought over in welled steam-vessels, and are kept in the wooden reservoirs already alluded to, some of which may be seen at Hole Haven, on the Essex side of the Thames. Once upon a time, some fifty years ago, one of these wooden lobster-stores was run into by a Russian frigate, whereby some 20,000 lobsters were set adrift to sprawl in the muddy waters of the Thames. In order that the great mass of animals confined in these places may be kept upon their best behaviour, a species of cruelty has to be perpetrated to prevent their tearing each other to pieces; the great claw is rendered paralytic by means of a wooden peg being driven into a lower joint.

I have no intention of describing all the members of the crustacea; they are much too numerous to admit of that, ranging as they do from the comparatively giant-like crab and lobster down to the millions of minute insects which at some places confer a phosphorescent appearance on the waters of the sea. My limits will necessarily confine me to a few of the principal members of the family—the edible crustacea, in fact; and these I

shall endeavour to speak about in such plain language as I think my readers will understand, leaving out as much of the fashionable "scientific slang" as I possibly can.

The more we study the varied crustacea of the British shores, the more we are struck with their wonderful formation, and the peculiar habits of their members. I once heard a clergyman at a lecture describe a lobster in brief but fitting terms as a standing romance of the sea—an animal whose clothing is a shell, which it casts away once a year in order that it may put on a larger suit—an animal whose flesh is in its tail and legs, and whose hair is in the inside of its breast, whose stomach is in its head, and which is changed every year for a new one, and which new one begins its life by devouring the old! an animal which carries its eggs within its body till they become fruitful, and then carries them outwardly under its tail; an animal which can throw off its legs when they become troublesome, and can in a brief time replace them with others; and lastly, an animal with very sharp eyes placed in moveable horns. The picture is not at all overdrawn. It is a wondrous creature this lobster, and I may be allowed a brief space in which to describe the curious provision of nature which allows for an increase of growth, or provides for the renewal of a broken limb, and which applies generally to the edible crustacea.

The habits of the principal crustacea are now pretty well understood, and their mode of growth is so peculiar as to render a close inspection of their habits a most interesting study. As has been stated, a good-sized lobster will yield about 20,000 eggs, and these are hatched, being so nearly ripe before they are abandoned by the mother, with great rapidity—it is said in forty-eight hours—and grow quickly, although the young lobster passes through many changes before it is fit to be presented at table. During the early periods of growth it casts its shell frequently. This wonderful provision for an increase of size in the lobster has been minutely studied during its period of moulting. Mr. Jonathan Couch says the additional size which is gained at each period of exuviation is perfectly surprising and, it is wonderful to see the complete covering of the animal cast off like a suit of clothes, while it hides, naked and soft, in a convenient hole, awaiting the growth of its new crust. In fact, it is difficult to believe that the great soft animal ever inhabited the cast-off habitation which is lying beside it, because the lobster looks, and really is, so much larger. The lobster, crab, etc., change their

shells about every six weeks during the first year of their age, every two months during the second year, and then the changing of the shell becomes less frequent, being reduced to four times a year. It is supposed that this animal becomes reproductive at the age of five years. In France the lobster-fishery is to some extent "regulated." A close-time exists, and size is the one element of capture that is most studied. All the small lobsters are thrown back to the water. There is no difficulty in observing the process of exuviation. A friend of mine had a crab which moulted in a small crystal basin. I presume that at some period in the life of the crab or lobster growth will cease, and the annual moulting become unnecessary; at any rate, I have seen crabs and other crustaceans taken from an island in the Firth of Forth which were covered with parasites evidently two or three years old.

To describe minutely the exuviation of a lobster, crab, or shrimp, would in itself form an interesting chapter of this work, and it is only of late years that many points of the process have been witnessed and for the first time described. Not long ago, for instance, it was doubtful whether or not the hermit-crabs (*Anomoura*) shed their skin; and that fact being settled, it became a question whether they shed the skin of their tail! There was a considerable amount of controversy on this delicate point, till the "strange and unexpected discovery" was made by Dr. Harper. That gentleman was fortunate enough to catch a hermit-crab in the very act, and was able to secure the caudal appendage which had just been thrown off. Other matters of controversy have been instituted in reference to the growth of various members of the crustacea; indeed, the young of the crab in an early stage have before now been described by naturalists as distinct species, so great is the metamorphosis they undergo before they assume their final shape. Another point of controversy at one period existed in reference to the power of crustaceans to replace their broken limbs, or occasionally to dispense, at their own good pleasure, with a limb, when it is out of order, with the absolute certainty of replacing it; but it is an undoubted fact that they are endowed with that power.

When the female crustacea retire in order to undergo their exuviation, they are watched, or rather guarded, by the males; and if one male be taken away, in a short time another will be found to have taken his place. I do not think there is any particular season for moulting; the period differing in different

places, according to the temperature of the water and other circumstances.

The mode in which a hen lobster lays her eggs is curious : she lodges a quantity of them below her tail, and bears them about for a considerable period ; indeed, till they are so nearly hatched as only to require a very brief time to mature them. When the eggs are first exuded from the ovary they are very small, but before they are committed to the sand or water they increase considerably in size, and become as large as good-sized shot. Lobsters may be found with eggs, or "in berry" as it is called, all the year round ; and when the hen is in process of depositing her eggs she is not good for food, the flesh being poor, watery, and destitute of flavour.

When the British crustacea are in their soft state they are not considered as being good for food, I say this in opposition to Mr. Buckland, but, curiously enough, the land-crabs are most esteemed while in that condition. The epicure who has not tasted "soft crabs" should hasten to make himself acquainted with one of the most delicious luxuries of the table. The eccentric land-crab, which lives far inland among the rocks, or in the clefts of trees, or burrows in holes in the earth, makes in the spring-time an annual pilgrimage to the sea in order to deposit its spawn, and the young, guided by an unerring instinct, return to the land in order to live in the rocks or burrow in the earth like their progenitors. In the fish-world we have something nearly akin to this. We have the salmon, that spends one-half its life in the sea, and the other half in the fresh water ; it proceeds to the sea to attain size and strength, and returns to the river in order to perpetuate its kind. The eel, again, just does the reverse of all this : it goes down to the sea to spawn, and then proceeds up the river to live ; and at certain seasons it may be seen in myriad quantities making its way up stream. The march of the land-crabs is a singular and interesting sight : they congregate into one great army, and travel in two or three divisions, generally by night, to the sea ; they proceed straight forward, and seldom deviate from their path unless to avoid crossing a river. These marching crabs eat up all the luxuriant vegetation on their route ; their path is marked by desolation. The moment they arrive at the water the operation of spawning is commenced by allowing the waves to wash gently over their bodies. A few days of this kind of bathing assists the process of oviposition, and knots of spawn similiar to lumps of herring-roe

are gradually washed into the water, which in a short time finishes the operation. Countless thousands of these eggs are annually devoured by various fishes and monsters of the deep that lie in wait for them during the spawning season. After their brief seaside sojourn, the old crabs undergo their moult, and at this period thousands of them sicken and die, and large numbers of them are captured for table use, soft crabs being highly esteemed by all lovers of good things. By the time they have recovered from their moult the army of juveniles from the seaside begins to make its appearance in order to join the old stock in the mountains; and thus the legion of land-crabs is annually recruited by a fresh batch, which in their turn perform the annual migration to the sea much as their parents have done before them.

An inquiry into our lobster and crab supplies took place some years ago, when it was found that these animals were becoming less plentiful and were gradually diminishing in size. Much interesting evidence was taken as to the demand for these shell-fish—it was for instance stated that at one period 600,000 lobsters were annually brought to England from the seas of Norway, and about twenty or thirty thousand from France. It was elicited in the course of the enquiry that the “berried hens” were more valuable than other lobsters (worth twice as much), the cooks valuing the coral-tinted spawn for decorating dishes of fish and for the making of sauces. In consequence there is an enormous waste of our lobster supplies constantly going on now, as an ounce of these eggs numbers 6,700; it is obvious that every hen lobster which is captured when it is big with spawn, simply means the extermination in time of these crustacean dainties of the table, which, by the bye, the late Mr. Frank Buckland said were in their best condition for food when big with their berry! It is sufficiently curious that gravid lobsters should be in prime condition for food, when it is well known that all other animals are, at such periods, uneatable. Legislation followed the inquiry alluded to, but I regret to say it was most imperfect, as while it restricts the size of all lobsters to be caught, it permits the taking of berried hens when they are over the indicated size. This is a concession to the cooks which I have never ceased to denounce, but it formed part of the finding of the commissioners; it is in fact, one of Mr. Buckland’s blunders.* The crabs were also

* Regarding this part of the lobster question, I wrote as follows in the *Quarterly Review* for October, 1877 :—“The commissioners although they

legislated for and a size decreed under which they must not be captured. Up to the date of the act last passed, the destruction of all kinds of crustaceans in an immature form had been enormous, small lobsters and still smaller crabs being annually brought to market in tens of thousands ; bringing to those who captured them an almost nominal price. As one catcher of crabs very sensibly remarked to the commissioners, "it would be far better that a crab which is worth only threepence should be left in the water till it becomes worth sixpence." It should always be remembered in dealing with our larger crustaceans that they are captured individually, and are handled while alive, and that therefore, it would be an easy matter to restore them again to the sea, if found to be small or in berry.

Before leaving the crabs and lobsters, it is worthy of remark that an experienced dealer can tell at once the locality whence any particular lobster is obtained—whether from the west of Ireland, the Orkney Islands, or the coast of Brittany. The shelly inhabitants of different localities are distinctly marked. Indeed fish are peculiarly local in their habits, although the vulgar idea has hitherto been that all kinds of sea animals herd indiscriminately together ; that the crab and the lobster crept about the bottom rocks, whilst the waving skate or the swaggering ling fish dashed about in mid-water, the prowling "dogs" busily preying on the shoals of herring supposed to be swimming near ; the brilliant shrimp flashing through the crowd like a meteor ; the elegant saithe keeping them company ; the whole being overshadowed by a few whales, and kept in awe by a dozen or so of

were advised to urge that the sale of berried fish should be prohibited, find themselves unable to do so, and, we venture to think, for very weak or most illogical reasons, as, for instance, 'if it were illegal to take berried lobsters, it could not pay the fishermen in many cases to pursue the fishery ;' and likewise, (and this is news to us), that the lobster when berried is in the very best condition for food, and it would be as illogical therefore to prohibit its capture, as to prohibit the taking of full herrings. Again, 'berried lobsters are, it must be remembered especially valuable ; the berries are in great demand for sauce and for garnish for fish and salad,' and accordingly he must run the risk of exterminating a valuable animal to please our cooks ! This concession to the cooks is the blot of the report. If berried lobsters were not allowed to be sold, it would not prevent the capture of an abundant supply of the other kinds. The case of the lobster and the herring as regards spawning are not analogous : we cannot obtain access to the herring except when it is on the point of spawning, and, then like the lobster, it is in its very worst condition as a food product, as all fish are at their spawning time."

sharks ! Nothing can be more different than the reality of the water-world, which is colonised quite as systematically as the earth. Particular shoals of herring, for instance gather off particular counties ; the Lochfyne herring, as I have mentioned in the account of the herring-fishery, differs from the herring of the Caithness coast or that of the Firth of Forth ; and any 'cute fish-monger can tell a Tweed salmon from a Tay one. The herring at certain periods gather in gigantic shoals, the chief members of the Gadidæ congregate on vast sand-banks, and the whales occasionally roam about in schools ; while the Pleuronectidæ occupy sandy places in the bottom of the sea. We have all heard of the great cod-banks of Newfoundland, of the fish community of Rockall ; then is there not the Nymph Bank, near Dublin, celebrated for its haddocks ? have we not also the Faroe fishing-ground, the Dogger Bank, and other places with a numerous fish population ! There are wonderful diversities of life in the bosom of the deep ; and there is beautiful scenery of hill and plain, vegetable and rock, and mountain and valley. There are shallows and depths suited to different aspects of life, and there is life of all kinds teeming in that mighty world of waters, and the fishes live

“ A cold sweet silver life, wrapped in round waves,
Quickened with touches of transporting fear.”

The prawn and the shrimp are ploughed in innumerable quantities from the shallow waters that lave the shore. The shrimper may be seen any day at work, pushing his little net before him. To reach the more distant sand-banks he requires a boat ; but on these he captures his prey with greater facility, and richer hauls rewards his labour than when he plies his putting-net close inshore. The shrimper, when he captures a sufficient quantity, proceeds to boil them ; and till they undergo that process they are not edible. The shrimp is “the ‘Undine’ of the waters,” and seems possessed by some aquatic devil, it darts about with such intense velocity. Like the lobster and the crab, the prawn periodically changes its skin ; and its exertions to throw off its old clothes are really as wonderful as those of its larger relatives of the lobster and crab family. There are a great many species of shrimp in addition to the common one ; as, for instance, banded, spinous, sculptured, three-spined, and two-spined. Young prawns, too, are often taken in the “ putting-net ” and sold for shrimps. Prawns are caught in some places in pots resembling those used

for the taking of lobsters. The prawn exuviates very frequently; in fact, it has no sooner recovered from one illness than it has to undergo another. Although the prawn and the shrimp are exceedingly common on the British coasts, when we consider the millions of these "sea insects," as they have been called, which are annually consumed at the breakfast tables and in the tea-gardens of London alone (not to speak of those which are greedily devoured in our watering-places, or the few which are allowed to reach the more inland towns of the country,) we cannot but wonder where they all come from, or who provides them; and the problem can only be solved by taking into account the fact that we are surrounded by hundreds of miles of a productive seaboard, and that thousands of seafaring people, and others as well, make it their business to supply such luxuries to all who can pay for them. It is even found profitable to send these delicacies to England all the way from the remote fisheries of Scotland.

The art of "shrimping" is well understood all round the English coasts. The mode of capturing this particular member of the crustacea is by what is called a shrimp-net, formed of a frame of wood and twine into a long bag, which is used as a kind of miniature kind of trawl-net; each shrimping-boat being provided with one or two of these instruments, which scraping along the sand compel the shrimp to enter. Each boat is provided with a "well," or store, to contain the proceeds of the nets, and on arrival at home the shrimps are immediately boiled for the London or other markets. The shrimpers used to be rather ill-used by the trade. Of the many thousand gallons sent daily to London, they were said only to get an infinitesimal portion of the money produce. The retail price in London used to be four shillings per gallon, out of which the producer got only threepence! I have been told that the railways charge at the extraordinary rate of £9 a ton for the carriage of this delicacy to London. It is interesting to watch the shrimpers at their work, and such of my readers as can obtain a brief holiday should run down to Leigh, or some nearer fishing place where they can see the art of shrimping carried on in all its picturesque beauty. At the place mentioned all who live in or about it are more or less interested in the shrimp trade. The take of these shell-fish varies considerably, but on some occasions large quantities are obtained, as many as 1000 gallons are frequently despatched to Billingsgate, and sometimes double that quantity will be captured, boiled,

picked, and sent off. The price now received fluctuates very much, it ranges from tenpence to about four shillings and sixpence per gallon; the red shrimps it may be mentioned are not so valuable as the brown ones. As in all fisheries "shrimping" is much of a lottery; there is a fleet of over a hundred small boats at Leigh, and on occasion a boat has earned as much as twenty pounds in one day.

I need scarcely mention the cray fish, they are numerous in all our large streams, and in France exceedingly plentiful. The fresh water cray-fish is delightful; those taken in the sea are much longer in size, but much coarser. These shell-fish are not plentiful in the British Islands. In Scotland the larger whelks are not eaten to any extent, but cockles are often on sale and occasionally limpets.

There has hitherto been a fixed period for the annual sacrifice to crustacean gastronomy. There is a well-known time for the supplying of oysters, it is fixed by law, and is popularly supposed to be confined to the month in the spelling of which the letter R occurs. The season for lobsters begins about March, and is supposed to close with September, so that in the round of the years we have always some crustacean or molluscan delicacy to feast upon.

FISH CULTURE.—PART I.

Antiquity of Pisciculture—Italian Fish-Culture—Sergius Orata—Re-discovery of the Art—Shaw *versus* Gehin and Remy—Jacobi—Shaw of Drumlanrig—The Ettrick Shepherd—Scientific and Commercial Pisciculture—A trip to Huningue—Bale and its Fishmarket—Huningue described—The Water Supply—*Modus Operandi* at Huningue—Packing Fish-Eggs—An important Question—Artificial Spawning—Danube Salmon—Plan of a Suite of Ponds—M. de Galbert's Establishment—Practical Nature of Pisciculture—Turtle-Culture—Best Kinds of Fish to rear.

THE art of fish-culture is almost as old as civilisation itself. We read of its having been practised in the empire of China for many centuries, and we also know that it was much thought of in the palmy days of ancient Italy, when expensively-fed fish of all kinds were a necessity of the wonderful banquets given by wealthy Romans and Neapolitans. In China a large trade in fish-eggs is still carried on, and boats may be seen containing men who gather the spawn in various rivers, and then carry it into the interior of the country for sale, where the young fish are reared in great flocks or shoals in the rice-fields. One Chinese mode of collecting fish-spawn is to map out a river into compartments by means of mats and hurdles, leaving only a passage for the boats. The mats and hurdles intercept the spawn, which is skimmed off the water, preserved for sale in large jars, and is bought by persons who have ponds or other pieces of water which they may wish to stock with gold or other fish. Another plan is to hatch fish-eggs in paddy fields, and in these places the spawn speedily comes to life, and the flocks of little fishes are herded from one field to another as the food becomes exhausted. The trade in ova is so well managed, even in the present day, that fish are plentiful and cheap—so cheap as to form a large portion of the food of the people; and nothing so much surprises the Chinese who come here as the high price paid for the fish of this country.

A Chinese fisherman was much astonished, some years ago, at the price he was charged for a fish-breakfast at Toulon. This person had arrived in France with four or five thousand young fish of the best kinds produced in his country, for the purpose of their being placed in the great marine aquarium of the Bois de Boulogne. Being annoyed at the comparative scarcity of fish

in France, the young Chinaman wrote a brief memoir, showing that, with the command of a small pond, any quantity of fish might be raised at a trifling expense. All that is necessary, he stated in the memoir alluded to, is to watch the period of spawning, to throw yolks of eggs into the water from time to time, by which means an incredible quantity of young fry are saved from destruction. For, according to the information conveyed by this very intelligent youth, thousands of infantile fish annually die from starvation—they are unable to seek their own food at so tender an age. Many of the stories we hear about the Chinese mode of breeding fish are evidently exaggerated; but one particularly ingenious method of artificial hatching which has been resorted to by the people of China is worth noting as a piscicultural novelty. These ingenious Celestials carry on a business in selling and hatching fish-spawn, collecting the impregnated eggs from various rivers and lakes, in order to sell them to proprietors of canals and private ponds. When the proper season for hatching arrives, they empty a hen's egg, by means of a small aperture, sucking out the natural contents, and then, after substituting fish-spawn, close up the opening. The egg thus manipulated is placed for a few days under a hen! By and by the shell is broken, and the contents are placed in a vessel of water, warmed by the heat of the sun only; the eggs speedily burst, and in a short time the young fish are able to be transported to a lake or river of ordinary temperature, where they are of course left to grow to maturity without being further noticed than to have a little food thrown to them.

The luxurious Romans achieved great wonders in the art of fish breeding, and were able to perform curious experiments with the piscine inhabitants of their aquariums; they were also well versed in the arts of acclimatisation. A classic friend, who is well versed in ancient fish lore, tells me that the great Roman epicures could run their fish from ice-cold water into boiling cauldrons without handling them! They spared neither labour nor money in order to gratify their palates. The Italians sent to the shores of Britain for their oysters, and then flavoured them in large quantities on artificial beds. The value of a Roman gentleman's fish in the palmy days of Italian banqueting was represented by an enormous sum of money. The stock kept up by Lucullus was never valued at a less sum than £35,000! These classic lovers of good things had pet breeds of fish in the same sense as gentlemen in the present day have pet breeds of

sheep or horned cattle. Lucullus, for instance, to have such a valuable stock, must have been in possession of unique varieties derived from curious crosses, etc. Red mullet or fat carp, which sold for large prices, were not at all uncommon. Sixty pounds were given for a single mullet, more than three times that sum being paid for a dish of that fish; and enormous sums of money were lavished in the buying, rearing, and taming of the mullet; so much so, that some of those who devoted their time and money to this purpose were satirised as mullet millionaires. One noble Roman went to a fabulous expense in boring a tunnel through a mountain, in order to obtain a plentiful supply of salt-water for his fish-ponds.

Sergius Orata invented artificial oyster-beds. He caused to be constructed at Baïæ, on the Lucrine Sea, great reservoirs, where he grew the dainty mollusc in thousands; and in order that he and his friends might have this renowned shell-fish in its very highest perfection, he built a palace on the coast, in order to be near his oyster-ponds; and thither he resorted when he wanted to have a fish-dinner free from the care and turmoil of business. Many of the more luxurious Italians, imitating Sergius Orata, expended fabulous sums of money on their fish-ponds, and were enabled, by means of their extravagance, to achieve all kinds of *outré* results in the fattening and flavouring of their fish. A curious story, illustrative of these times and of the value set on fish of a particular flavour, is related, in regard to the bass (*labrax Lupus*) which were caught in the river Tiber. The Roman epicures were very fond of this fish, especially of those caught in a particular portion of the river, which they could distinguish by means of their taste and fine colour. An exquisite, while dining, was horrified at being served with bass of the wrong flavour, and loudly complained of the badness of the fish; the fact being that the real bass (the high-coloured kind) were flavoured by the disgusting food which they obtained at the mouth of a common sewer.

The modern phase of pisciculture is entirely a commercial one, which as yet does not lie in imparting fanciful flavours to fish, but has developed itself both at home and abroad in the replenishing of exhausted streams with salmon, trout, or other kinds of fish. The present idea of pisciculture, as a branch of commerce, is due to the shrewdness of a simple French peasant, who gained his livelihood as a *pêcheur* in the tributaries of the Moselle, and the other streams of his native district, *La Bresse*

in the *Vosges*. He was a thinking man, although a poor one, and it had long puzzled him to understand how animals yielding such an abundant supply of eggs should, by any amount of fishing, ever become scarce. He knew very well that all female fish were provided with tens of thousands of eggs, and he could not well see how, in the face of this fact, the rivers of La Bresse should be so scantily peopled with the finny tribes. Nor was the scarcity of fish confined to his own district: the rivers of France generally had become impoverished; and as in all Catholic countries fish is a prime necessary of life, the want of course was greatly felt. Joseph Remy was the man who first found out what was wrong with the French streams, and especially with the fish supplies of his native rivers—and, better than that, he discovered a remedy. He ascertained that the scarcity of fish was chiefly caused by the immense number of eggs that never came to life, the enormous quantity of young fish that were destroyed by enemies of one kind or another, and the fishing-up of all that was left, in many instances, before they had had an opportunity to reproduce themselves; at any rate, without any care being taken to leave a sufficient breeding stock in the rivers, so that the result he discovered had become inevitable.

The guiding fact of pisciculture has been more than once accidentally re-discovered—that is, allowing that the ancient Romans knew it exactly as now practised; but nothing came of such discoveries, and till a discovery be turned to some practical use, it is, in a sense, no discovery at all. After being lost for many hundred years, the art of artificially spawning fish was re-discovered in Germany by one Jacobi, and practised on some trout more than a century ago. This gentleman not only practised pisciculture himself, but wrote essays on the subject as well. His elaborate treatise on the art of fish-culture was written in the German language, but was translated into Latin, and inserted by Duhamel du Monceau in his *General Treatise on Fishes*. Jacobi, who practised the art for thirty years, was not satisfied with a mere discovery, but at once turned what he had discovered to practical account, and, in the time of Jacobi, great attention was devoted to pisciculture by various gentlemen of scientific eminence. Count Goldstein, a savaan of the period, likewise wrote on the subject. The *Journal* of Hanover also contained papers on this art, and an account of Jacobi's proceedings was enrolled in the Memoirs of the Royal Academy of Berlin. This discovery of Jacobi was the simple result of keen observa-

tion of the natural action of the breeding salmon. Observing that the process of impregnation was entirely an external act, he saw at once that this could be easily imitated by careful manipulation; so that, by conducting artificial hatching on a large scale, a constant and unfailing supply of fish might readily be obtained. The results arrived at by Jacobi were of vast importance, and obtained not only the recognition of his government, but also the more solid reward of a pension.

Some persons dispute the claims of France to the honour of this discovery, asserting that the peasant Remy had borrowed his idea from the experiments of the late Mr. Shaw of Drumlanrig, who had by the artificial system undertaken to prove that parrs were the young of the salmon. Mr. Shaw's experiments were very complete and laborious; they extended over a number of years, were reported to the Royal Society of Scotland, and were brought to a successful conclusion long before the re-discovery of the art of pisciculture by Remy. In my opinion the honours may be thus divided, whether Remy knew of Shaw's experiments or not: I would give to Scotland the honour of having re-discovered pisciculture as an adjunct of science, and to France the useful part of having turned the art to commercial account. In regard to what has been already stated here as to the accidental discovery of artificial fish-breeding, James Hogg, the Ettrick Shepherd, it has been mentioned already in a previous page, was one of the discoverers. Hogg had an observant eye, and anxiously studied and experimented on fish-life. He took an active share in the parr controversy. Having seen with his own eyes the branded parr assuming the scales of the smolt, he never doubted after that the fact that the parr was the young of the salmon. In Norway, too, an accidental discovery of this fish-breeding power was made; and certainly if salmon-fishing in that country goes on at its present rate cultivation will be largely required. The artificial plan of breeding oysters has been more than once accidentally discovered. There is at least one well-authenticated instance of this, which occurred about a century ago, when a saltmaker of Marennnes, who added to his income by fattening oysters, lost a batch of six thousand in consequence of an intense frost, the shells not being sufficiently covered with water; but while engaged in mourning over his loss and kicking about the dead molluscs, he found them, greatly to his surprise, covered with young oysters already pretty well developed, and these, fortunately, although tender, all in good

health, so that ultimately he repeopled his salt-bed without either trouble or expense—having, of course, to wait a year or two for the growth of the natives before he could recommence his commerce.

To return to Remy, however, his experiments were so instantaneously crowned with success as even to be a surprise to himself; and in order to encourage him and Gehin, a coadjutor he had chosen, the Emulation Society of the Vosges voted them a considerable sum of money and a handsome bronze medal. But it was not till 1849 that the proceedings of the two attracted that degree of notice which their importance demanded both in a scientific and economic sense. Dr. Haxo of Epinal then communicated to the Academy of Sciences at Paris an elaborate paper on the subject, which at once fixed attention on the labours of the two fishermen—in fact, it excited a sensation both in the Academy and among the people. The government of the time at once gave attention to the matter, and finding, upon inquiry, everything that was said about the utility of the plan to be true, resolved to have it extended to all rivers in France, especially to those of the poorer districts of the country. The artificial system of fish-breeding was by this mode of action rapidly extended over the chief rivers of France, and added much to the comfort of the people, and in some cases little fortunes were realised by intelligent farmers who appreciated the system, and had a pond or stream on which they could conduct their experiments in safety. The piscicultural system culminated in France, chiefly under the direction of Professor Coste, in the erection of a great establishment at Huningue, near Bale, for the collection and distribution of fish eggs. In order to see this place with my own eyes, and so be enabled to describe exactly how the piscicultural business of France is administered, I paid a visit to the great laboratory.

Bent on a piscatorial tour, I noted with care the spots of water that pretty often fringed the line of rails, and wondered if they were populated by any of the finny tribe; if so, by what kind of fish, and whether they had been replenished by the aid of pisciculture? There was evidently fishing in the districts passed through, because at some of the stations there was the vision of an occasional angler, and a frequent “flop” in many of the pools which we passed convinced me that fair sport might be had; and an entry of an occasional Waltonian into some of the stations with a few pounds weight of trout quite excited every-

body, and made some of us long to whip the waters of the district of Champagne, through which we were passing. And a close inspection of the national *établissement de pisciculture* at Huningue has convinced me that if any river in France be still fishless, it is not through any fault of the government.

As even the longest journey will come to an end, the train arrived in due time at Mulhouse, or Mulhausen, as it is called in the German, and it being late and dark, and all of us (I was one of a little party) somewhat fatigued, we allowed ourselves to be carried to the nearest hotel, a large uncomfortable, dirty-looking place, where apparently they seldom see British gold, and make an immense charge for *bougies*. Being within scent of Switzerland, having the feeling that we were in the shadow of its mountains, and almost within hearing of its many waters, we hurried on by the first morning train to Bale. The distance is short, and the conveyance quick. Almost before we had time to view the passing landscape, which is exceedingly beautiful, being rich in vineyards and orchards, and rapidly turning Swiss-like in its scenery, we were stopped at St. Louis by the custom-house authorities, who, it is but proper to say, are exceedingly polite to all honest travellers. I would advise any one in search of the *établissement de pisciculture* at Huningue to leave the train at this station. Not knowing its proximity at the time of my visit, I went right on to Bale.

Poets might go into raptures about Bale—Bale the beautiful—with the flowing Rhine cutting it into two halves, its waters green as the icefields which had given them birth, its houses quaint, its streets so clean, its fountains so antique; but we had no time to go into raptures—our business was to get to Huningue, and curiously enough we had wandered into the fishmarket before we knew where we were. Like various other fishmarkets which we have visited, it contained no fish that we could see. Hailing a *voiture*, our party had no end of difficulty to get the coachman to understand where we wanted to be driven. I said, “To Huningue;” he then suggested that it must be “Euiniguen,” and a Scotch young lady friend, who was all in a glow about the “beautiful Rhine,” as, of course, a young lady ought to be, suggested that the pronunciation might be “Hiningue,” which proved a shrewd guess, as immediately on hearing it we were addressed in tolerable but rather lame English by a quiet-looking coachman, who said, “Come with me; I have study the English grammaire; I know where you want to go, and will take you.”

Although I could not help wondering that such a celebrated place, as we all thought Huningue ought to be, was not better known, I felt pretty sure our coachman knew it; and having persuaded my Scotch friend and his young lady to take a drive, we at once started for the *établissement de pisciculture*, where we were most hospitably received by the superintendent, who at once proceeded to conduct us over the whole place with great civility and much attention.

The series of buildings which have been erected at Huningue are admirably adapted to the purpose for which they have been designed. The group forms a square, the entrance portion of which—two lodges—is devoted to the *corps de garde*, the centre has been laid out as a kind of shrubbery, and is relieved with two little ponds containing fish. The whole establishment, ponds and buildings, occupies a space of eighty acres. The suite of buildings comprise at the side two great hatching galleries, 60 metres in length and 9 metres broad, containing a plentiful supply of tanks and egg-boxes; and in the back part of the square are the offices, library, laboratory, and residences of the officers. Having minutely inspected the whole apparatus, I particularly admired the aptitude by which the means to a certain end had been carried out, which is worth describing in a brief way. The egg-boxes are raised in pyramids, the water flowing from the one on the top into the boxes below. The grand agent in the hatching of fish-eggs being water, I was naturally enough rather particular in making inquiry into the water supplies of Huningue, and these I found were very ample. They are derived from three sources—springs on the private grounds of the establishment, the Rhine, and the Augraben stream. The water of the higher springs is directed towards the buildings through an underground conduit, whilst those rising at a lower level are used only in small basins and trenches for the experiments in rearing fish outside. Being uncovered, however, they are easily frozen, and are besides frequently muddy and troubled. As a general rule, fish are not bred at Huningue, the chief business accomplished there being the collection and distribution of their eggs; but there is a large supply of tanks or troughs for the purpose of experimenting with such fish as may be kept in the place. The waters of the Rhine, being at a higher level than the springs, can be at once employed in the *appareils* and basins. The waters of the Augraben stream, which cross the grounds, are of very little use. Nearly dry in summer, rapid and muddy after rain, they have only hitherto

served to supply some small exterior basins. Of course, different qualities of water are quite necessary for the success of the experiments in acclimatisation carried on so zealously at this establishment. Some fish delight in a clear running stream, while others prefer to pass their life in sluggish and fat waters. The engineering of the different water supplies, all of them at different levels, has been effectually accomplished by M. Coumes, the engineer of this department of the Rhine, who, in conjunction with Professor Coste, planned the buildings at Huningue; indeed the machinery of all kinds is as nearly as possible perfect.

The course of business at Huningue is as follows :—The eggs are brought chiefly from Switzerland and Germany, and embrace those of various kinds of trout, the Danube, and Rhine salmon, and the tender Ombre chevalier. People are appointed to capture gravid fish of these various kinds, and having done so to communicate with the authorities at Huningue, who at once send an expert to deprive the fishes of their spawn and bring it to the breeding or store boxes, where it is carefully tended and daily watched till it is ready to be dispatched to some district in want of it. The mode of artificial spawning is as follows, and I will suppose the subject operated upon to be a salmon :—Well, first catch your fish ; and here I may state that male salmon are a great deal scarcer than female ones, but fortunately one of the former will milt two or even three of the latter, so that the scarcity is not so much felt as it might otherwise be. The fish, then, having been caught, it should be seen, before operating, that the spawn is perfectly matured, and that being the case, the salmon should be held in a large tub, well buried in the water it contains, while the hand is gently passed along its abdomen, when, if the ova be ripe, the eggs will flow out like so many peas. The eggs must be carefully roused or washed, and the water should then be poured off. The male salmon may be then handled in a similar way, the contact of the milt immediately changing the eggs into a brilliant pink colour. After being again washed, the eggs, may be ladled out into the breeding-boxes, and safely left to come to maturity in due season. Very great care is necessary in handling the ova. The eggs distributed from Huningue are all carefully examined on their arrival, when the bad ones are thrown out, and those that are good are counted and entered upon the records of the establishment, which are carefully kept. The usual way of ascertaining the quantity is by means of a little stamped measure, which varies according to the particular fish-

eggs to be counted. The ova are watched with great care so long as they remain in the boxes at Huningue, and any dust is removed by means of a fine camel-hair brush, and from day to day all the eggs that become addled are removed.

The applications to the authorities at Huningue for eggs, both from individuals and associations, are always a great deal more numerous than can be supplied; and before second applications from the same people can be entertained, it is necessary for them to give a detailed account of how their former efforts succeeded. The eggs, when sent away, are nicely packed in boxes among wet moss, and they suffer very little injury if there be no delay in the transit.

"How about the streams from which the eggs are brought!" I asked. "Does this robbery of the spawn not injure them?"

"Oh, no; we find that it makes no difference whatever. The fish are so enormously fecund that the eggs can be got in any quantity, and no difference be felt in the parent waters; what we obtain here are a mere percentage of the grand totals deposited by the fish."

Of course, as the operations are pursued over a large district of two countries, no immediate difference will be felt; but how if these Huningue *explorateurs* go on for years taking away tens of thousands of eggs? Will not that ultimately prove a case of robbing Peter to pay Paul? I know full well that all kinds of fish are enormously prolific, and the reader would see from the figures given in a former section that it is so; but suppose a river, with the breeding power of the Tay, was annually robbed of a few million eggs, the result must some day be a slight difference in the productive power of the water. I would like to know with exactitude if, while the waters of France are being replenished, the rivers in Switzerland and Germany are not beginning to be in their turn impoverished? It surely stands to reason that if the impoverishment of streams resulting from natural causes be aided by the carrying away of the eggs by zealous *explorateurs*, they must become in a short time almost totally barren of fish. The best plan, in my opinion, is for each river to have its own breeding-ponds on the plan of those of Stormont-field on the river Tay, or to obtain eggs from some general source of supply organised for that special purpose.

It would scarcely pay to breed the commoner fishes of the lakes and rivers, as pike, carp, and perch; the commonest fish bred at Huningue is the *tera*, whilst the most expensive is the

beautiful ombre chevalier, the eggs of which cost about a penny each before they are in the water as fish. The general calculation, however, appertaining to the operations carried on at Huningue gives twelve living fish for a penny. The *fera* is very prolific, yielding its eggs in thousands; it is called the herring of the lakes; and the young, when first born, are so small as scarcely to be preceptible. The superintendent at Huningue told me that several of them had escaped by means of the canal into the Rhine, where they had never before been found. I inquired particularly as to the Danube salmon, but found that it was very difficult to hatch, especially at first, great numbers of the eggs, as many sometimes as 60 or 70 per cent, being destroyed; but now the manipulators are getting better acquainted with the *modus operandi*, and it is expected that by and by the assistants at Huningue will be successful with this fish as they are with all others. Even allowing for a very considerable loss in the artificially-manipulated ova—and it is thought that two-thirds at least of the eggs of this fish are in some way lost—it is certain that the artificial system of protection is immensely more productive in fish than the natural one, for it has been said, in reference especially to the salmon of the river Tay, that hardly one in a thousand of the eggs ever reaches maturity as a proper table-fish, such is the enormous destruction of eggs and young fry; and the percentage of destruction in Catholic countries is very much larger, because during those fast-days enjoined by the Church fish *must* be obtained.

The piscicultural establishment of M. de Galbert, one of the most important of the kind which exists in France, is worthy of notice. It is situated at Buisse in the canton of Voiron in Isere, a department on the south-east frontier of France. The works comprise four ponds for the reception of the various stages of growth. The first is about 100 metres long by 3 m. 50 in breadth, with a mean depth of 1 metre. It is almost divided into two parts, a sheet of water and a stream, by a peninsula, and the division is completed by a grating which prevents the mixing of the fish contained in each part, and also arrests the ascent or descent of the fry. The sheet of water is supplied from sources of an elevated temperature which diverge into the stream, and thence into pond No. 2. This basin (2) is 150 metres long, with a mean breadth of 8 metres, and a depth varying from 1 to 2 metres. Besides the waters from the first pond, this basin is supplied from the springs, and from the mill-

stream which rises from a rock situated at a distance of 200 metres. This pond contains fish of the first year. A sluice or water-gate placed in the deepest part of the pond, affords the means of turning the water and the fish contained therein into the pond No. 3. Courses of rough stones and weeds line the banks of the pond, and form places of shelter for the fish, besides encouraging the growth of such shell-fish as shrimps, lobsters, etc. The third pond (3) has a surface of about 5000 yards, with a depth equal to that of the second pond. An underground canal runs along the eastern side, and at distances of 2 metres trenches lined with stones loosely thrown together join the canal to the basin, and allow the fish to circulate through these subterranean passages, where every stone becomes a means of shelter and concealment. The adult trout can conceal themselves in the submerged holes and crevices of the islands, of which there are three in the pond. The narrowest part of the basin is crossed by a viaduct of 8 metres, to the arch of which is fitted an iron grating with rods in grooves to receive either a sluice or a snare. The sluice, formed of fine wire, keeps out the fish that would destroy the spawn at the time of fecundation. The spawn is covered with a lawyer of fine round gravel, to the thickness of 0 m, 30, which the trout can easily raise as fast as it bursts the egg. The snare or netting encloses the fish destined for artificial breeding without hurting them, and also secures the fish that are to be consumed, and those which it is necessary to destroy because of their voracity, as the pike. A floodgate placed at the lower end of the pond permits the pond to be emptied when necessary, and an iron grating prevents the escape of the fish. All the ponds are protected by a double line of galvanised iron wire placed on posts armed with hooks, and yet low enough to allow a boat to pass. The water of the ponds finally passes into the Isere, where a permanent snare allows strange fish to penetrate into the ponds. At spawning time a great many trout deposit their spawn there. The small pond (4) fed by the mill-stream is a sort of reservoir for large fish destined for sale or domestic use. Throughout the year the fish caught in the nets of the third pond are placed in this basin, so when the spawning season arrives it is a vast nursery for the purpose of reproduction. In the house built near the bridge of the third pond lodge the guard and the hatching-apparatus. The *appareils* are similar to those employed at the Collège de France, and are supplied from a spring. One

particular appareil, placed in a source of which the temperature never varies, is slightly different from the other models: it is simply zinc boxes pierced with very fine holes. This apparatus, which has been in use for three years, has given great satisfaction. It may be added that the establishment at Buisse can supply 40,000 or 50,000 young trout in the year at five centimes each, a result which is mainly due to the care and solicitude with which M. de Galbert has conducted his operations.

What strikes us most in connection with the history of French fish-culture is the essentially practical nature of all the experiments which have been entered upon. There has been no toying in France with this revived art of fish-breeding. The moment it was ascertained that Remy's discoveries in artificial spawning were capable of being carried out on the largest possible scale, that scale was at once resolved upon, and the government of the country became responsible for its success, which was immediate and substantial. The discoverer of the art was handsomely rewarded; and the great building at Huningue, used as a place for the reception and distribution of fish eggs, testifies to the anxiety of France to make pisciculture one of the most practical industries of the present day. Unceasing efforts are still being made by the government to extend the art, so that every acre of water in that country may be as industriously turned to profit as the acres of land are. Why should not an acre of water become as productive as an acre of land? We have an immensity of water space that is comparatively useless. The French people are now beginning thoroughly to appreciate the value of their lakes and rivers, and to cultivate them with the greatest possible assiduity—there is not an acre of water in the country that is not turned to use by the people. Think of the fish-ponds of Doombes being of the extent of thirty thousand acres! No wonder that in France pisciculture has become a government question, and been taken under the protecting wing of the state.

The different kinds of water in France are carefully considered, and only fish suitable for them placed therein. In marsh places eels alone are deposited, whilst in bright and rapid waters trout and other suitable fish are now to be found in great plenty. Attention is at present being turned to sea-fish, and the latest "idea" that has been promulgated in connection with the cultivation of sea-animals is turtle-culture. The artificial multiplication of turtle, on the plan of securing the

eggs and protecting the young till they are able to be left to their own guidance, is advocated by M. Salles, who is connected with the French navy, and who seems to have a considerable knowledge of the nature and habits of the turtle. To some extent turtle-culture is already carried on in the island of Ascension—so far at least as the protection of the eggs and watching over the young is concerned. M. Salles proposes, however, to do more than is yet done at Ascension; he thinks that, to arrive quickly at a useful result, it would be best to obtain a certain number of these animals from places where they are still abundant, and transport them to such parks or receptacles as might be established on the coasts of France and Corsica, where at one time turtles were plentiful. Animals about to lay would be the best to secure for the proposed experiments; and these might be captured when seeking the sandy shores for the purpose of depositing their eggs. Male turtles might at the same time be taken about the islets which they frequent. A vessel of sufficient dimensions should be in readiness to bring away the precious freight; and the captured animals, on arriving at their destination, should be deposited in a park chosen under the following considerations:—The formation of the sides to be an inclosure by means of an artificial barrier of moderate height, formed of stones, and perpendicular within, so as to prevent the escape of the animals, but so constructed as to admit the sea, and, at the same time, allow of a large sandy background for the deposition of the eggs, which are about the size of those laid by geese. As the turtles are herbivorous, the bottom of the park should be covered with seaweeds and marine plants of all kinds, similar to those the animal is accustomed to at home. A fine southern exposure ought to be chosen for the site of the park, in order to obtain as much of the sunshine as possible, heat being the one grand element in the hatching of the eggs. Turtles are very fond of sunshine, and float lazily about in the tropical water, seldom coming to the shore except to lay. This they do in the night-time: crawling cautiously ashore, and scraping a large hole in a part of the sand which is never reached by the tide, they deposit their eggs, and carefully cover them with the sand, leaving the sun to effect the work of quickening them into life.

It may be as well to state here that the French people eat all kinds of fish, whether they be from the sea, the river, or the lake, or the canal. In Scotland and Ireland salmon only are bred artificially, in a commercial sense, chiefly because it is a valuable and money-

yielding animal, and no other fresh-water fish is regarded in these countries as being of value except for sport. In France large quantities of eels are bred and eaten; but in Scotland and in some parts of England, the people have such a horror of that fish that they will not touch it. This of course is due to prejudice, the eel being good for food in a very high degree. In all Roman Catholic countries there are so many fast-days that fish-food becomes to the people an essential article of diet; in France this is so, and the consequence is that a good many private amateurs in pisciculture are to be found in that country; but the mission of the French Government in connection with fish-culture is apparently to meddle only with the rearing and acclimatising of the more valuable fishes. It would be a waste of energy for the authorities at Huningue to commence the culture of the carp, or perch. In our Protestant country there is no demand for the commoner river or lake fishes except for the purposes of sport; and with one or two exceptions, such as the Lochleven trout, the charr, etc., there is no commerce carried on in these fishes. One has but to visit the fishmarket at Paris to observe that all kinds of fresh-water fish and river crustacea are there ranked as saleable, and largely purchased. The mode of keeping these animals fresh is worthy of being followed here. They are kept alive till wanted in large basins and troughs, where they may at all times be seen swimming about in a very lively state.

FISH CULTURE.—PART II.

Fish culture in Germany—The Danube salmon—The Stormontfield salmon ponds described—Suggestions for the extension of Pisciculture—Lochleven Hatchery—Fish-hatching at Colzean Castle—Mr. Duncan of Benmore's experiments—Mr. A. G. Anderson's hatchery at Linlithgow—Mr. Armitstead's fishery—Howietoun.

As soon as the piscicultural system became known, it rapidly extended over the whole continent of Europe, and the rivers of Germany were among the first to participate in the advantages of artificial cultivation. In particular may be noticed the efforts made to increase the supplies of the Danube salmon, a beautiful and excellent food-fish, with a body similar to the trout, but still more shapely and graceful, and which if allowed time, is said to grow to an enormous size. The young salmon of the Danube are always of a darker colour than those a little older, but they become lighter in colour as they progress in years. The mouth of this fish is furnished with very strong teeth; its back is of a reddish grey, its sides and belly perfectly white; the fins are bluish white; the back and the upper part of both sides are slightly and irregularly speckled with black and roundish red spots. This fish is very prolific. Professor Wimmer of Landshut, the authorities at Huningue mentioned that they had frequently obtained as many as 40,000 eggs from a female specimen which weighed only eighteen pounds. Our own *Salmo salar* is not so fecund, it being well understood that less than a thousand eggs per pound weight is about the average spawning power of British salmon. The ova of the Danube salmon are hatched in half the time that our salmon eggs require for incubation—viz. in fifty-six days—while the young fry attain the weight of one pound in the first year; and by the third year, if well supplied with the requisite quantity of food, they will attain a weight of four pounds. The divisions of growth of the great fish of the Danube, as compared with *Salmo salar*, are pretty nearly as follows:—Our fish, curiously enough, may at the end of two years be five pounds in weight, or it may not be half that number of ounces. One batch of a salmon hatching go to the sea at the end of the first year after birth, and rapidly return as grilse, handsome four-pound fish, whilst the

other moiety remain in the fresh water till the expiry of the second year from the time of birth, so that *they* require about thirty months to become four-pound fish, by which time the first moiety are salmon of eight or ten pounds! These are ascertained facts. This is rapid growth when compared with the Danube fish, which, after the first year, grows only at about the rate of eighteen ounces per annum. But, even at that rate, fish-cultivation must pay well. Suppose, for the sake of an illustration, that by the protected or piscicultural system a full third (*i.e.* 13,500) of the 40,000 eggs arrive in twelve months at the stage of pound fish, and are sold at the rate of threepence per pound weight, a revenue of £162 would thus result in one year's time from a single pair of breeding salmon! Two pairs would, of course, double the amount, and so on.

A series of well-conducted operations in fish-culture has been carried on for about thirty years on the River Tay, about five miles from Perth. These have attracted a great amount of attention, and although now about to be discontinued they merit description.

The salmon breeding ponds at Stormontfield are beautifully situated on a sloping haugh on the banks of Tay, and are sheltered at the back by a plantation of trees. The ground has been laid out to the best advantage, the ponds, water-runs, etc., having been planned and constructed by Mr. Peter Burn, C.E. The supply of water is obtained from a rapid mill-stream, which runs in a line with the river Tay. The necessary quantity of water is first run from this stream into a reservoir, from which it is filtered through pipes into a little watercourse at the head of the range of boxes from whence it is laid on. These boxes are fixed on a gentle declivity, half-way between the mill-race and the Tay, and by means of the slope the water falls beautifully from one to another of the "procreant cradles" in a gradual but constant stream, and collects at the bottom of the range of boxes in a kind of dam, and thence runs into a small lake or *dépôt* where the young fish are kept. For some years after the experiments were begun only one pond was to be found at Stormontfield, but another pond for the smolts was in time added in order to complete the suite. A sluice made of fine wire-grating admits of the superfluous water being run off into the Tay, so that an equitable supply is invariably kept up. It also serves for an outlet to the fish when it is deemed expedient to send them out to try their fortune in the greater deep near at hand, and for which

their pond experience has been a mode of preparation. The planning of the boxes, ponds, sluices, etc., has been accomplished with great ingenuity; and one can only regret that the whole apparatus is not three times the size, so that the Tay proprietors might breed annually two or three millions of salmon, which would add largely to the productiveness of that river, and of course aid in increasing the rental.

The salmon-breeding operations at Stormontfield originated at a meeting of the proprietors of the river Tay, held in July 1852. On the suggestion of Mr. Ashworth, a practical pisciculturist was engaged to inaugurate the breeding operations, and to teach a local fisherman the art of artificial spawning. The preparation of the spawn for the nursing boxes was commenced on the 23d of November 1853, and in the course of a month 300,000 ova were deposited in the 300 boxes, which had been carefully filled with prepared gravel, and made all ready for their reception. Mr. Ramsbottom, who conducted the manipulation, says the river Tay is one of the finest breeding streams in the world, and thinks that it would be presumptuous to limit the number of salmon that might be bred in it were the river cultivated to the full extent of its capabilities.

The date when the first of the eggs deposited was observed to be hatched was on the 31st of March, a period of more than four months after the stocking of the boxes; and during April and May most of the eggs had burst into life, and the fry were observed waddling about the breeding-boxes, and were in June promoted to a place in the reception-pond, being then tiny fish a little more than an inch long. The first year's experiments were remarkably successful in showing the practicability of hatching, rearing, and maintaining in health, a very large number of young fish, at a comparatively trifling cost. The artificial breeding of salmon is still carried on at these ponds, and with very great success, when their limited extent is taken into account: half-a-million of eggs are said to have been hatched every year, but that statement, I fancy, must be taken with a grain of salt. The fish, it is remarkable, suffer no deterioration of any kind by being bred in the ponds, and can compare in every respect with those bred in the river.

The ponds at Stormontfield were originally designed with a view to breed 300,000 fish per annum, but after a trial of two years it was found, from a specialty in the natural history of the salmon elsewhere alluded to, that only half that number of fish

could be bred in each year. The egg-boxes at Stormontfield, unlike those at Huningue, are in the open air, and in consequence the eggs are exposed to the natural temperature, and take, on an average of the seasons, about 120 days to ripen into fish. For instance, the eggs laid down in November 1872, did not come to life till 29th March 1873. The young fish, as soon as they are able to eat—which is not for a few days, the umbilical bag supplying all the food required for a time by the newly-hatched animal—are fed with particles of boiled liver. It would, of course, have been a simple plan to turn each year's fish out of the ponds into the river as they were hatched, but it was thought advisable rather to detain them till they were seized with the migratory instinct and assumed the scales of smolthood, which occurs, as already stated in other parts of this work, at the age of one and two years respectively. The experiments conducted at the Stormontfield ponds conclusively settled the long-fought battle of the parr, and proved indisputably that the parr is the young of the salmon, that it becomes transformed to a smolt, grows into a grilse, and ultimately attains the honour of full-grown salmonhood.

The anomaly in the growth of the parr was also attempted to be solved at Stormontfield, but without success. In November and December 1857 provision was made for hatching in separate compartments the artificially impregnated ova of—1, parr and salmon; 2, grilse and salmon; 3, grilse pure; 4, salmon pure. It was found, when the young of these different matches came to be examined early in April 1859, that the sizes of each kind varied a little, the superintendent of fisheries informing us that—"1st, the produce of the salmon with salmon are 4 in. in length; 2d, grilse with salmon, $3\frac{1}{2}$ in.; 3d, grilse with grilse, $3\frac{1}{2}$ in.; 4th, parr with grilse 3 in.; 5th, smolt from large pond, 5 in." These results of a varied manipulation never got a fair chance of being of use as a proof in the disputation; for, owing to the limited extent of the ponds at the time, the experiments were matured in such small boxes or pools as evidently tended to stunt the growth of the fish. Up to the present time the riddle which has so long puzzled our naturalists in connection with the growth of the salmon has not been solved. A visitor whom I met at the ponds was of opinion that a sufficient quantity of milt was not used in the fructification of the eggs, as the male fish were scarcer than the female ones, and that those eggs which first came into contact with the milt produced the stronger fish.

The late Mr. Robert Buist used to say that what most struck strangers who visited the ponds was the great disparity in the size of fish of the same age, the difference of which was only that of a few weeks, as all were hatched by the month of May. That there are strong and weak fry from the moment that they burst the covering admit of no doubt, and that the early fish may very speedily be singled out from among the late ones is also quite certain. In the course of a few weeks the smolts that are to leave at the end of the first year can be noted. The keeper's opinion is that at feeding-time the weak are kept back by the strong, and therefore are not likely to thrive so fast as those that obtain a larger portion of food; he lays great stress on feeding, and his opinion on that subject is entitled to consideration.

The following summary of what was achieved in salmon-breeding in the earlier years in Stormontfield ponds may prove careful to persons who are studying the subject of Pisciculture:—

On the 23d November 1853 the stocking of the boxes commenced, and before a month had expired 300,000 ova were deposited, being at the rate of 1000 to each box, of which at that time there were 300. These ova were hatched in April 1854, and the fry were kept in the ponds till May 1855, when the sluice was opened, and one moiety of the fish departed for the river and the sea. About 1300 of these were marked by cutting off the dead or second dorsal fin. The smolts marked were about one in every hundred, so that about 130,000 must have departed, leaving more than that number in the pond. The second spawning, in 1854 was a failure, only a few thousand fish being produced. This result arose from the imperfect manipulation of the fish by those entrusted with the spawning. The third spawning took place between the 22d November and the 16th December 1855, and during that time 183,000 ova were deposited in the boxes. These ova came to life in April 1856. The second migration of the fry spawned in 1853 took place between the 20th April and 24th May 1856. Of the smolts that then left the ponds, 300 were marked with rings, and 800 with cuts in the tail. Many grilse having the mark on the tail were re-taken, but none of those marked with the ring. The smolts from the hatching of 1856 left the pond in April 1857. About 200 were marked with silver rings inserted into the fleshy part of the tail; about 1700 with a small hole in the gill-cover; and about 600 with the dead fin cut off in addition to the mark in the gill-cover. Several grilse with the mark on the gill and tail were caught and

reported, but no fish marked with the ring. The fourth spawning took place between the 12th November and the 2d December 1857, when 150,000 ova were deposited in the boxes. These came to life in March 1858. Of the smolts produced from the previous hatching, which left the pond in 1858, 25 were marked with a silver ring behind the dead fin, and 50 with gilt copper wire. Very few of this exodus were reported as being caught. The smolts produced from the hatching of 1858 left the pond in April 1859, and 506 of them were marked. The fifth spawning, from 15th November to 13th December 1859, produced 250,000 ova, which were hatched in April 1860. Of the smolts that left in 1860, 670 were marked, and a good many of them were reported as having been caught on their return from the sea. The smolts of the hatching of 1860 left the pond in May 1861, but none of them were marked. The number of eggs deposited in the breeding-boxes in the spawning season of 1862 (November and December) was about 250,000; but in 1863 not more than 80,000 ova could be obtained in consequence of the unfavourable state of the river for capturing gravid salmon. The pisciculture of salmon and other fresh-water fishes is not now a novelty in the United Kingdom; many experiments in salmon and trout breeding having been instituted, with more or less success, both in Ireland and England.

I should like to see one of the great rivers of England turned into a gigantic salmon "manufactory." Ponds might be readily constructed on one or two places of the Severn, or on some of the other suitable salmon streams of England or Wales, capable of turning out two millions of fish per annum, and at a comparatively trifling cost. The formation of the ponds would be the chief expense; a couple of men could watch and feed the fry with the greatest ease. The size adopted might be five times that of the ponds on the river Tay, and the original cost of these was less than £500. Except by the protecting of the spawn and the young fish from their numerous enemies, there is no way of meeting the present great demand for salmon, which, when in season, is in the aggregate of greater value than the best butcher's meat, dear as beef and mutton now are. The salmon is an excellent fish to work with in a piscicultural sense, because it is large enough to bear a good deal of handling, and it is very accessible to the operations of mankind, because of the instinct which leads it to spawn in the fresh water instead of the sea. It is only such a fish as this monarch of the brook that would

individually pay for artificial breeding, for, having a high money value as an animal, it is clear that salmon-culture would in time become as good a way of making money as cattle-feeding or sheep-rearing.

There are waste places in England—the Essex marches, for instance, or the fens of Norfolk—where it would be profitable to cultivate eels or other fish after the manner of the inhabitants of Comacchio. The English people are fond of eels, and would be able to consume any quantity that might be offered for sale, and the place being in such close proximity to the Thames, other fish might be cultivated as well. All the best portions of the hydraulic apparatus of Comacchio might be imitated, and to suit the locality, such other portions as might be required could be invented. The art of pisciculture is but in its infancy and we may all live in the hope of seeing great water farms—to be profitable, they must be gigantic—for the cultivation of fish in the same sense as we have extensive grazing or feeding farms for the breeding and rearing of cattle.

In Ireland, the late Mr. Thomas Ashworth, of the Galway fisheries, found it as profitable and as easy to breed salmon as it is to rear sheep. His fisheries became a decided success; and, if we except the cost of some extensive engineering operations in forming fish-passes to admit of a communication with the sea, the cost of his experiments was trifling and the returns exceptionally large.

After many years the breeding operations carried on at Stormontfield for the purpose of stocking the Tay with salmon are, I believe about to be discontinued; at the present time, the boxes are only partially used. A new hatchery on the modern system has been erected in order to aid the salmon supply of the river Tay. The operations are carried on under cover, and the boxes (glass grilles and with trays) enable as many as 300,000 ova to be dealt with in any one year. Hatching is usually accomplished under 66 days, and the loss of eggs and newly born fish is very trifling, only a little over two per cent. The water supply of the Dupplin hatcheries is excellent, both as regards quality and quantity, twelve gallons per minute being the rate of flow in the hatching house. The leading idea which prevailed in reference to the nursery at Stormontfield was that, in consequence of the great mortality which attends salmon-breeding under the natural conditions of fish life, it would be well to keep the young fish till they were able to fight their own

battle of life, and therefore, the fish bred at Stormontfield nursery, were not parted with till they had assumed the scales of smolthood and their instinct to seek the sea had been developed. But the Dupplin hatchery is guided by other ideas; the fish after being kept for about forty days being then placed in the river Tay and its tributaries, and allowed to "chance it" among the numerous enemies which are always seeking to devour them. It is difficult to say how far the present plan will succeed,—very very few, I fear, of the 300,000 young ones will ever be captured as table fish, still the experiment is one worth making if only three thousand of the fry placed in the water—and that is a very moderate per centage—should be spared to become 20lb. fish, the speculation would undoubtedly be most remunerative at present prices.

Several small fish hatcheries have been constructed in Scotland during the last eight or ten years. I may name two or three of these which I have seen; one of them has been fitted up in connection with Loch Leven, the cost of its erection being a little over £200, and its hatching capacity is 200,000 eggs. This experiment was only commenced in 1883, so that it is somewhat premature to speak of its success, but on a few previous occasions Sir James Gibson Maitland was good enough to send to the Loch an occasional supply of young fish hatched at Howietoun, the "speciality" of which is the Lochleven trout, now to be found in a hundred different rivers and lochs, bred from ova or fry obtained from the Howietoun fishery. At one time it was thought the Lochleven trout would thrive no where else but in that classic sheet of water, now we know better. It would be interesting to have details of how the trout supplied from Howietoun have thriven in the strange lochs and rivers to which they have been forwarded in the course of the last five years.

The Marquis of Ailsa started a hatchery at Culzean Castle in Ayrshire in 1876, which was originally capable of accommodating 100,000 eggs, but the hatching capacity of which has since been more than doubled and some interesting experiments I understand, have been made in breeding Rhine salmon. At Culzean the eggs are all hatched in the old-fashioned way on gravel and with satisfactory results. Some lochs on the estate of the Marquis have been stocked with fish, whilst the young salmon manipulated have been added to the fish stock of the river Doon the fry being turned out as soon as umbilical sac has been absorbed. Mr. Duncan of Benmore tried some interesting

experiments in the way of increasing the size of the salmon of the river Echaig, which he succeeded in doing. He introduced to that river young salmon hatched from ova procured from both Tay and Tweed. I have often speculated on the good that might be done by crossing the salmon of different rivers. There would, I presume, be no practical difficulty in impregnating the eggs of female salmon caught in the Tay with the milt of fish taken in the tributaries of the classic Tweed. An interesting bit of work in connection with what is generally called "pisciculture," has been lately inaugurated within the grounds of the old Royal Palace of Linlithgow, where there is a pretty sheet of water. Mr. A. G. Anderson, the well known Edinburgh fish merchant, has erected a suite of hatcheries capable of containing over half a million ova, and the eggs of trout are being treated so successfully that the loss is under three per cent. the period of hatching is found to be a little over sixty days. Among the noteworthy experiments entered upon by Mr. Anderson may be mentioned one which ought to attract attention, it is that eggs taken from dead and diseased fish have come to life, the fry having thriven much better than was to be expected. Mr. Anderson intends to try if that interesting fish the shoodic salmon can be localised in Scotland, and with that view brought from America some 20,000 eggs, which arrived in good condition and have been hatched out with but a small percentage of loss.

Mr. Armitstead, who is well known as a practical pisciculturist, and who established a fishery in the year 1868 at Troutdale near Keswick in Cumberland, to which I paid a visit, has removed his establishment to a place on the Solway, in the Stewartry of Kirkcudbright. This gentleman breeds a variety of fish, several kinds of trout, char, salmon, grayling, etc., of which in all, ova and fry, he can accommodate about a million as stock in hand, but his hatching accommodation is very extensive, and his ponds numerous—over a score indeed.

The Scottish "fishery" of the piscicultural kind which has of late years attracted most attention, is that situated at Howietoun near Stirling, which is of great dimensions, and has cost in construction and fittings a sum of about fifteen thousand pounds. The designing and promotion of this establishment has been a labour of love to its proprietor, who is sparing no pains to render it complete, and is yearly adding to its apparatus. At Howietoun ten millions of ova can be hatched every year, and there are suites of ponds (thirty two ponds in all) in which are con-

tained tens of thousands of trout and other fish in all stages of growth; in 1883, as many, I have been told, as 90,000 yearling trout were sent out from the fish reservoirs of the establishment. Sir James Gibson Maitland is a keen pisciculturist and is engaged at present in several interesting experiments in cross breeding, which I have no doubt will in good time be made public. It may interest persons who think of starting fisheries at other places, to know that it requires a staff of over a dozen persons to work the Howietoun establishment, which requires a flow of one million gallons of water every twenty four hours to keep it going. The feeding of the finny flocks at Howietoun is a matter of grave importance. Clams are brought from the Firth of Forth and are eagerly devoured, and many an old horse is ultimately thrown to the fish. All interested in fish culture should visit Howietoun; they will be made welcome.

"The real question at issue, and it is one on which the future of Pisciculture depends is, can it be made to pay?" Like most other questions of the day, the question of fish-rearing has become a breeches pocket question. We have been stigmatised more than once as a "nation of shopkeepers," and we have been sensible enough to accept the "sneer" as a compliment and, as if to prove the case, we are making a "business" of fish culture. What may be termed commercial pisciculture has now been well inaugurated. By "commercial Pisciculture" is meant the buying and selling of fish ova and newly hatched fry, as well as of young fish further on the road to maturity. Hitherto our effects in Pisciculture have usually been in connection with some particular river or lake; now we are provided with more than one independent "concern" prepared to supply to all and sundry newly fecundated fish eggs, eyed ova, fry, or grown fish of many kinds, suitable for stocking barren lochs or rivers.

FISH CULTURE.—PART III.

Fresh-water Fish Culture—Possibilities of Sea Fish Culture—Sale of Fish Spawn—American Plans of Sea Fish Culture.

Enough has now, I think, been said about the cultivation of fresh water fish. Except in the case of the salmon, which is common to both salt and fresh water, the *£.s.d.* of the question is not of any importance as bearing on the national commissariat. But in respect of the trout, which is undoubtedly our finest sporting fish, its cultivation will probably become universal, or at least will be the chief feature of all fresh water piscicultural establishments, seeing that there are crowds of sportsmen everywhere to angle for it. The letting of trout and salmon streams along with grouse moors and deer forests, has become a feature of the times, and the possessors of such properties will no doubt see to the stocking of their waters, now that they can order eggs or yearlings from the various "fisheries." It does not require much argument to prove that well stocked lakes and rivers have a far better chance of being let at a good rent than waters which are but scantily populated with the finny tribes. In carrying out any plan of re-stocking a lake or river, pains must be taken to ascertain the right number of fish it can carry; if too many trout are placed in a stream, the lot are likely to prove lean and flavourless, as the supply of food is limited.

So far as I know very little has been accomplished in this country in the way of breeding sea fish on the piscicultural plan; a few "experiments" I believe have been made, but that is all.

The culture of the cod, haddock, and turbot, all of which are in constant demand for food, opens up a wide field to industry and wealth, but unfortunately, as the sea with its boundless expanse of waters and its wealth of fish, is open to all who can find the machinery of capture, no man will sow what he has no certainty of reaping; in other words, sea-fish culture will never become an individual effort, and when the day arrives, as it assuredly will, when we shall have to take in hand the augmentation of our supplies of cod and turbot, as well as other valuable food fishes, what we do will require to be the outcome of some national effort, that is to say, any scheme for the multiplication of our sea

fishes will have to be carried out under the superintendence of some body acting by request of the government of the period. That it is possible to gather the eggs of fish, impregnate them, and nurse them into life in vast numbers—tens of millions—even in the sea, has long since been shown in the United States to be practical. What has been done on the other side of the Atlantic can, without doubt, be successfully imitated in our British waters. The theory of the most expert American pisciculturists seems to be, “fish away and capture all you can, we will take heed of the morrow and bring to life millions of ova, that without personal care, would be lost to our food resources.”

That is a way of stating the matter that at first sight seems rather rough and ready ; but it will bear looking into quite as well as those other theories which have for their foundation, a “close time” as being the only remedy for our decreasing supplies of fish ; that some at least of our food fishes have of late decreased is now being generally acknowledged. As is well known to all fishery economists, the waste of fish life is constant and enormous. I do not remember in any former year to have seen such large “dollops” of fish spawn offered for sale as during the present season (1885), when in the shop of one fish merchant, I noticed something like half a hundredweight of the eggs of the cod fish ready to be dealt out to customers. Could these roes and the milts which I saw have been left in the sea, and only a tenth part of them been allowed to come to life, the product would have been several millions of fish. A cod fish of thirty pounds weight will yield about six millions of eggs, and I feel sure that in the shop alluded to, I must have seen fifteen or sixteen complete cod roes, but, say there were only ten, and we see at a glance that sixty millions of eggs were being in a sense wasted. The “dollops” of course brought so much to the vendor—threepence a pound weight I believe, and the eggs furnish a toothsome fry ; but had they remained in the sea and, as has been suggested, six millions of them had become saleable cod fish, at, say a shilling each, the sum of our fishery wealth would thereafter have been increased by £300,000 ! A learned authority on the subject of the natural history of fish and fishery economy, has enunciated the opinion that “it matters not where you fish, when you fish, or how you fish,” but I have never been of that opinion, and do not believe in such dangerous doctrine. I have more than once indeed tried to show, and not un-

successfully I think, that our supplies of fish are not commensurate to the machinery now employed to capture them.

In enunciating any scheme for the increasing of our supplies of sea fish we are always confronted with the great fact that the sea is free to all who choose to dip their nets in its waters, so that, as has been indicated, any scheme of pisciculture must not only be national, it must be international. If we were to hatch and leave in our own immediate waters every year some twenty or thirty millions of the best of our food fishes, we have no security that they will remain where we desire, namely within territorial boundaries. Fish must go where they can find their food in its greatest abundance, and they also seek instinctively the best places to spawn, so that difficulties beset the imaginative pisciculturist on all sides. Our great fish pond is the German Ocean, its extent is measured in thousands of miles, and tens of thousands of acres of tolerably productive fishing ground. It has become the resort of all nations which can obtain convenient access to its waters, with the natural result, of course, consequent on the incessant drain on its resources, that some sorts of fish found in it, particularly the sole, are becoming scarce. In the event then of any general scheme of sea fish culture being entered upon, each nation fishing would require to be taxed in order to meet the expense. Were each vessel fishing to be assessed in the small sum of one pound yearly, it would in all probability yield a sufficient sum for carrying on the work of recuperation at ten or twelve different stations, as happily the operations incidental to pisciculture are not of an expensive kind. Suppose there were ten stations in operation at a cost of three thousand pounds per annum, they might in time become the means of very largely augmenting the national fish supply. Only the large fishes might be dealt with—they are easily handled and are of the greatest value. As has been already indicated, there are no "practical" difficulties in the way. Our cod fish, for example, are all individually handled, they are taken alive and can be kept living till they are wanted for the market; that being so, they could be easily enough deprived of their eggs and milt, which could be kept in "floaters" secure from enemies till the ova gave forth their young. Apparatus suitable for the hatching of sea-fish ova have been successfully tried in the American seas, and countless numbers of fish have by means of them been added to the natural stocks.

Such schemes, it may be said, look well on paper, and we shall

be told to remember the proverb that, "all that glitters is not gold," but objectors must bear in mind that practical pisciculture is now an established fact, and what has been done in hundreds can yet be done in thousands and tens of thousands; all that is required is the corresponding multiplication of the ways and means. In the territories of the United States so small a fish even as the herring has been successfully brought under the operation of pisciculture, and the shad too, has been multiplied by millions. Floating barges fitted up with very simple gear enclosed in safe places are all that is necessary. The eggs of different fishes require different modes of treatment. Some ova adhere to the bottom, others float *in* the water and others *on* it. Year by year we are learning these and similar truths, so that we are storing facts for our guidance in the paths of pisciculture. There is a point connected with the business of fish-growing which must be constantly borne in mind, and that is, as we increase our supplies, so must we increase their supplies of food. In all probability great numbers of the ova of one fish are devoured by some other fish to which it is food; if, therefore, we use up a great deal of ova we shall require to put something in its place, for in reality vast as is the area of our water ways, it will only feed a given number of fish. This is a truism which cannot be too frequently repeated, I have more than once brought to those persons who think that our salmon rivers are but scantily populated, the fact that, in reality some of them are overcrowded. Persons who are desirous of becoming acquainted with the piscine appetite should visit Howietoun, and see for themselves how far a horse will suffice for the feeding of a few thousands of hungry young trout.

THE FISHERIES OF FRANCE.

Boulogne—Modes of fishing in France—The fisheries of Arcachon—Fishing industry on the Foreshores—The sales of fish in Paris—Sardine curing at Concarneau.

CROSSING the Channel, we may note that the general sea fisheries of France are also being prosecuted with great vigour and at those places which have railways to bear away the produce with considerable profit. All kinds of fish are caught on the French coasts with much assiduity, and the coast-line of that country being enormous—in length, reaching from Dunkirk to Bayonne, including sinuosities, it will be considerably over 2000 kilometres—there is a great abundance of fish, the only regret in connection with the food fisheries being that at those places where the yield could be best obtained the fishing is but lazily prosecuted, in consequence of the want of inland conveyance. From many of the fishing villages there is no path to the populous inland cities, and the fish is sold, as it used to be sold in Scotland before the days of railways and other quick conveyances, by the wives of the fishermen, who hawk the produce of the sea through the country. In such towns as Boulogne, where there is a large resident population, and a constant accession of English visitors as well, the demand for fish is constant and considerable, and well supplied. In the department of the Pas de Calais there are over 600 fishing-boats. In Boulogne harbour, which is the chief port of the district, the English visitors will see a large number of boats, chiefly trawls, and all who visit Boulogne have seen the fishwives, if not dressed *en fête*, then in their work-a-day habits, doing hard labour for their husbands or tourists. Sea fish is scarce and dear over most of inland France; the prices in the market at Paris run very high for premier qualities, but in that gay capital there is apparently no scarcity. Fish must be had, and fish can always be obtained, whenever there is money to pay the price demanded. In fact, a glance at the fish department of the *Halles Centrales* would lead one to suppose that, next to growing fruit and vegetables, catching fish was the great industry of the country.

The modes of sea-fishing are so much alike in every country that it is unnecessary to do more than just mention that the

French method of trawling is very similar to our own. But there are details of fishing industry connected with that pursuit on the French coasts, that we are not familiar with in Britain. The neighbouring peasantry, for instance, come to the seaside and fish with nets which are called *bas parc*; and these are spread out before the tide is full, in order to retain all the fish which are brought within their meshes. The children of these land-fishers also work, although with smaller nets, at these foreshore fisheries, while the wives poke about the sand for shrimps and the smaller crustacea. These people thus not only ensure a supply of food for themselves during winter, but also contrive during summer to take as much fish as brings them in a little store of money.

By far the best place to study the economy of the French fisheries is at the basin of Arcachon, 34 miles from Bordeaux. There may be seen the small boat as well as the trawl fishery; and, above all, in the placid waters of the basin may be seen the model oyster-beds of France—beds that rarely languish for lack of spat, which has seldom been known to fail; beds which produce a nice, fat, tasteful oyster, placed in an inland sea that is prolific of many of the best food fishes, and contains the finest grey mullet in the world. To those who are anxious thoroughly to study the French mode of fishing, Arcachon has this advantage, that it has a day as well as a night fishery, and is also one of the most unique bathing-places in the whole of France. From the balconies of one's hotel, or from the windows of the houses, the whole industry of the basin may be observed daily and nightly; but the best plan for seeing a fishery is to take a part in it, to sail out in the boats, and handle the trawl or other nets. The chief fishing quarter is at the extreme east end of Arcachon, consisting of a cluster of wooden houses, easily known as those of the fishermen, from the various apparatus and articles of dress which are depending about, and from the "ancient and fish-like smell" which prevails in their neighbourhood. No less than thirteen hundred sailors find employment in and about the basin; and there are close on five hundred boats of all kinds, a number of them being steam trawlers. The value of the fishery of which Arcachon is the head-quarters is estimated at over 1,500,000*fr.*, exclusive of the revenue derived from the oyster-beds. In the basin there are lots of fish of all kinds, both round and flat, capital soles in tolerable abundance, and very excellent mullet, both red and grey; there are also occasional takes of

sardines, which fish is locally known as the *royan*. The steam-boats referred to go out into the Bay of Biscay to trawl, and carry also an immense net, which the men call a trammel; it is cumbersome and heavy, and can only be drawn in by using the steam-engine of the ship. Great "takes" of mullet are occasionally got at Arcachon by watching and hemming in shoals which get lost in the numerous creeks that indent the shores of the basin. There is a ready market for all the fish that can be taken in Bordeaux, Poitiers, Tours, and neighbourhood, and it is because of this market that there has grown up at Arcachon such a considerable fishing industry. The most picturesque part of the fishing industry carried on at Arcachon is the night fishery. Whenever it becomes dark enough the fishermen go out with the leister, and fish, as they used to do long ago in the Tweed, from an illuminated boat. Three men are required for each boat for the night fishing, two to row and one to hurl the spear. As many as a dozen boats may be seen nightly at this work, each with a brilliant flame of light flashing from its prow; the fish speared are mullet, and they are mostly used for local consumption, the accession of visitors in summer rendering a large supply of fish necessary. There are illuminated fisheries in some other parts of France, but that of Arcachon is the most prominent. The yield of fish, however, is not large—indeed it could not be, when it is taken into account that each individual fish has to be speared. Some more economical mode of night fishing, if night fishing be necessary, ought to be invented. A few scores of mullet are a poor reward for three or four hours' labour of three men.

The perpetual industry carried on by the coast people on the French foreshores is quite a sight, although it is fish commerce of a humble and primitive kind. Even the little children contrive to make money by building fish-ponds, or erecting trenches, in which to gather salt, or in some other little industry incidental to sea-shore life. One occasionally encounters some abject creature, groping about the rocks to obtain the where-withal to sustain existence. To these people all is fish that comes to hand; no creature, however slimy, that creeps about is allowed to escape, so long as it can be disguised by cookery into any kind of food for human beings. Some of the people have old rickety boats patched up with still older pieces of wood or leather, sails mended here and there, till it is difficult to distinguish the original portion from those that have been added

to it; nets torn and darned till they are scarce able to hold a fish; and yet that boat and that crippled machinery are the stock in trade of perhaps two or three generations of a family, and the concern may have been founded half a century ago by the grandfather, who now sees around him a legion of hungry gamins that would take a fleet of boats to keep in food and raiment. The moment the tide flows back, the foreshore is at once overrun with an army of hungry people, who are eager to clutch whatever fishy *debris* the receding water may have left; the little pools are eagerly, nay hungrily, explored, and their contents grabbed with that anxiety which pertains only to poverty.

On some parts of the French coasts, and it is proper to mention this, the fishery is not of importance, although fish are plentiful enough. At Cancale, for instance, the fishermen have imposed on themselves the restriction of only fishing twice a week. In Brittany, at some of the fishing places, the people seem very poor and miserable, and their boats look to be almost valueless, reminding one of the state of matters at Fittie in the outskirts of Aberdeen. At the isle of Croix, however, there is to be found a tolerably well-off maritime and fishing community; at this place, where the men take to the sea at an early age, there are about one hundred and thirty fishing boats of from twenty to thirty tons each, of which the people—*i.e.* the practical fishermen—are themselves the owners. At the Sands of Olonne there is a most extensive sardine-fishery—the capture of sprats, young herrings, and young pilchards, for curing as sardines, yielding a considerable share of wealth, as a large number of boats follow this branch of business all the year round. Experiments in artificial breeding are constantly being made both with white fish and crustaceans, and sanguine hopes are entertained that in a short time a plentiful supply of all kinds of shell and white fish will reward the speculators, and as regards those parts of the French coast which are at present destitute of the power of conveyance, the apparition of a few locomotives will no doubt work wonders in instigating a hearty fishing enterprise.

In fact the industry of the French as regards the fisheries has become of late years quite wonderful, and there is evidently more in their eager pursuit of sea wealth than all at once meets the eye. No finer naval men need be wished for any country than those that are to be found in the French fishing luggers, and there can be no doubt but that they are being trained with a view to the

more perfect manning of the French navy. At any rate the French people (? government) have discovered the art of growing sailors, and doubtless they will make the most of it, being able apparently to grow them at a greatly cheaper rate than we can do.

The commercial system established in France for bringing the produce of the sea into the market is of a highly elaborate and intricate character. The direct consequence of this system is, that the price of fish goes on increasing from its first removal from the shore until it reaches the market. This fact cannot be better illustrated than by tracing the fish from the moment they are landed on the quay by the fishermen, through various intermediate transactions, until they reach the hands of the fishmonger of Paris. The first agent into whose hands they come is the *ecoreur*. The *ecoreur* is usually a qualified man appointed by the owners of the vessels, the municipality, or by an association termed the *Société d'Ecorage*. He performs the functions of a wholesale agent between the fishermen and the public. He is ready to take the fish out of the fisherman's hands as soon as they are landed. He buys the fish from the fisherman, and pays him at once, deducting a percentage for his own services. This percentage is sometimes 5, 4, or even as low as $3\frac{1}{2}$ per cent. He undertakes the whole risk of selling the fish, and suffers any loss that may be incurred by bad debts or bad sale, for which he can make no claim whatever upon the owner of the boat. The system of *ecorage* is universally adopted, as the fisherman prefers ready money with a deduction of 5 per cent. rather than trouble himself with any repayment or run the risk of bad debts. Passing from the *ecoreur* we come to the *mareyeur*—that is the merchant who buys the fish from the wholesale agent. He provides baskets to hold the fish, packs them, and despatches them by railway. He pays the carriage, the town dues or duties, and the fees to the market-crier. Should the fish not keep, and arrive in Paris in bad condition, and be complained of by the police, he sustains the loss. As regards the transport arrangements, the fish are usually forwarded by the fast trains, and the rates are invariable, whatever may be the quality of the fish. Thus, turbot and salmon are carried at the same rate as monk fish, oysters, and crabs. On the northern lines the rate is 37 cents per ton per kilometre ; upon the Dieppe and Nantes lines, 25 or 26 cents ; which gives 85 or 96 francs as the carriage of a ton of fish despatched from the principal ports of the north—such as St. Valéry-sur-Somme,

Boulogne, Calais, and Dunkerque—and 130 francs per ton on fish despatched from Nantes.

The fish, on their arrival in Paris, are subjected to a duty. For the collection of this duty the fish are divided into two classes—viz. fine fresh fish and ordinary fresh fish. The fine fish—which class includes salmon, trout, turbot, sturgeon, tunny, brill, shad, mullet, roach, sole, lobster, shrimp, and oyster pay a duty of 10 per cent of the market value. The duty upon the common fresh fish is five per cent. This duty is paid after the sale, and is then of course duly entered in the official register.

All fish sent to Paris are sold through the agency of auctioneers (*facteurs à la criée*) appointed by the town, who receive a commission of 2 or 3 per cent. The auctioneer either sells to the fishmonger or to the consumer.

It will be seen from the above statement that between the landing of the fish by the fisherman and the purchase of it by the salesman at Paris there is added to the price paid to the fisherman 5 per cent for the *ecorage*; 90, 100, or 130 francs per ton for carriage; 10 or 5 per cent. with a double tithe of war, for town-dues; and 3 per cent. taken by the auctioneer—or, altogether, 18 or 13 per cent. besides the war-tithe and the cost of transport. This is an estimate of the indispensable expenses only, and does not include a number of items—such as the profit which the *mareyeur* ought to make, the cost of the baskets, carriage from the market to the railway, and from the custom-house to the market in Paris; besides presuming that the merchant who buys in the market is the consumer, which is seldom the case.

The capture and cure of the sardine is a great business in France, and especially at Concarneau, where as many as 13,000 men aid in the fishery. It is not easy to obtain accurate statistics of the business done in sardines. In the first place there is a large quantity sold fresh—that is, packed in dry salt, in little baskets made of rushes, and sent wherever there is a mode of outlet. Then there is an enormous number sold in those familiar tins. It is said that besides the quantity exported, which is large, there are as many as 4,000,000 boxes cured in oil and prepared for the home market; then, besides these, a large number are sold in barrels, and also pressed in barrels. It is an interesting sight to witness the arrival of the boats, and to see the rush to the curing establishments of the men, women, and children interested in the sales. How their *sabots* do clatter as

they prance over the stones! The curers just buy from day to day what sardines they require, and no more; generally speaking, they do not, as in the Scottish herring fishery, make contracts with boats, and only one or two firms have boats of their own. When the curers are in want of a supply of fish they put up a flag at their curing establishment, and the fishermen hurry to supply them, the price varying from day to day according as the fishery has been abundant or the reverse. As soon as the boats arrive the fish are put in train for the cure, by being gutted, beheaded, sorted into sizes, and washed in sea water, chiefly by women, who can earn from 12 francs to 20 francs a week at these curing establishments. The cure is begun by drying the fish on nets or willows, generally in the open air, but sometimes, from stress of weather it must be done under cover. After being dried they are ready for the process of the pan, which is kept over a furnace, and is filled with boiling oil. Into the cauldron the fish are plunged, two rows deep, arranged on wire gratings. In this pan of oil (the very finest olive oil) they remain for a brief period, till, in the judgment of the cook, they are done sufficiently. Then they are placed to drip, the drippings of oil being, of course, carefully collected; after which they are packed by women and girls into the nice little clean boxes in which they are sold. Again they are allowed to drip by the boxes being sloped; then each box, by means of a tap, is filled carefully up to its lip with pure olive oil, when it is ready for the next operation, which is the soldering on of the lids, or, as it may be called, the hermetical sealing up of the box, a most particular part of the process, at which the men can earn very large wages, with this drawback, that they have to buy all the fish that are spoilt. After the soldering has been accomplished the boxes have to be boiled in a steam chest. Those that do not bulge out after the boiling are condemned as "dead;" for when the process is thoroughly gone through the perfection of the cure is known by the bulging out of the boxes, which are of various sizes, according to the purpose for which they are designed. There are boxes of 6 lbs. weight and 21 lbs. weight, as also half and quarter boxes, with from 24 to 12 fish in them, according to size. Little kegs are also filled with sardines cured as anchovies. The finishing process of the sardine cure is to stamp the boxes and affix the thin brass labels which are always found upon them. There are little incidental industries connected with the cure which may be noticed. The *débris* is sold for agricultural

purposes, as is the case at home here, where the curers get a few pounds annually for their offal; then a large quantity of oil is exuded from the sprat during the process of the cure, and on the total fishery this oil is of considerable value. The "dead" fish, as we have said, are sold to the men, but the success of the cure is usually so great that the "dead" form but a very small percentage of the total number of boxes submitted to the test.

THE FISHERIES OF NORWAY AND SWEDEN.

Abundance of Cod-fish—Waste of Cod-Roe—The Herring Fishery—
Mackarel—Lobsters—Salmon—Oysters—Exports.

THE waters of Norway have long been famous for their prodigious supplies of valuable cod, the coast lines of that country affording suitable spawning places to the parent fish and sheltered nurseries to the young fry. The quantities of the larger members of the Gadidæ family, have always been considered inexhaustible, and mighty shoals of cod fish—"mountains" of them, run in to the coast chiefly at the spawning season, at which time they are caught in hundreds of thousands, or let me say at once, in literal millions. For the ten years ending in 1881, the number of cod-fish captured in Norwegian waters was 547,123,000, or at the rate of considerably over 54 millions per annum, a very large quantity. Taking the lot over head at 30 lbs each, we obtain a total weight in the period named of 16,413,690,000 lbs. The take of cod fish at the great Lofoten fishery is on the average about 23 millions per annum. It is stated on good authority that in some seasons the fish taken are lean of flesh and poor in quality—from which it has been argued that the body of fish is greater than there is food for. The inferior condition of the fish is known from their being comparatively barren of oil, good cod will give one barrel of medicinal cod liver oil to each 800 fish, but double that number of inferior cod, will not, as a rule, yield even one barrel of the valuable matter referred to. The occasionally impoverished condition of the Norway cod-fish has given rise to some of the old speculations as to whether or not, it is possible by any amount of capture to affect the productive power of the shoals. One writer on the subject says it has never yet been *proved* that such an effect is produced, the Lofoten shoals have been observed for a period of a thousand years, and they have never been known to diminish.

Mr. Frederick M. Wallem, the fishery commissioner sent by Norway to the International fisheries exhibition of 1883, tells us in his account of the Norwegian cod-fishery what, indeed, we know, that the reproductive power of the cod is extraordinarily great, at the rate of not less than 100,000 eggs for each pound

of its weight. In speaking of the Lofoten fishery Mr. Wallem says, "if only ten millions of female cod-fish would have the chance to deposit their eggs, each fish would yield at least one million of eggs : and if only one per cent of these were hatched out safely every coming spring, there would be codlings enough to form a new stock for an average take of 25 millions of cod for some thousands of years." I reprint this statement as it is given but I do not myself see how the result stated can be arrived at. Enormous quantities of cod roe are dealt with in Norway, as must of course, be the case with fish captured in the spawning season. The roe is mostly all exported to the value in some of the more productive years of the cod fisheries of over two million Kroners (18·2 K. is a pound sterling).

Another branch of fishing which has always bulked largely in Norway is that for herring, and the history of that particular fishery can be traced back with some degree of accuracy for several hundred years. During recent seasons, for the last fourteen years in fact, the herring fishery for "spawning" fish has declined from 800,000 barrels, to an average of about 30,000 barrels : the reason why such decline has taken place cannot be determined, but the "mountain" as the Norwegian fishermen call the shoal, has shrunk into a mole-hill. The winter herring fishery may therefore, be said to be, at any rate for a time an industry of the past, and the many millions of these fish which used to be captured are lost to industry and commerce. Curiously enough as the fishery for spawned herrings began to decline, another and even more lucrative branch of the same industry commenced to develop itself—still more curious it is also a winter herring-fishery but with the fish in a different condition—herrings of large size and little spawn. Again the late summer or fat herring-fishery has of late increased to such an extent as to render the total fishery, so far as its money value is concerned, as important as ever it was. About 700,000 barrels of these fat fish are taken every year, and we are informed that these particular herrings are the "best in the world," yielding when brought to market higher prices than any other kind of the same fish. The fat herring of Norway are "maiden herring" in the finest possible condition for flavour and food uses. The value of the Norwegian herring-fisheries to the men who capture the fish is very considerable, and has in some years amounted to nearly ten millions of kroners, while in less productive seasons, seven, six, and five millions have been earned.

There are other fisheries in Norway than those for cod and herrings. The fishermen receive about £40,000 every year for their catch of mackarel, and it is interesting to note that the fish bring better prices now that they are caught in large quantities by means of nets than they did when taken by hook and line. From the latest information placed at my service in respect of the Norwegian fisheries, I gather that the salmon is annually becoming scarcer because it has been "overfished." What Mr. Wallem says on the salmon-fisheries of his country is sensible, "I do not think," says that gentleman, "we shall be able to develop our salmon-fishery until we adopt the British system of protecting the spawning fish, assisted by means of hatching on a larger scale, and by more salmon ladders, and better or more effective laws. You may compare the salmon-fishery in the rivers with a poultry yard; you may be able to control every fish passing up or down the rivers and kill every one if you like."

As regards the shell-fish fisheries of Norway, I am in possession of some interesting notes about the Lobster, which continues, notwithstanding the enormous yearly capture of these dainties of the table to be tolerably plentiful, which may be attributed to the fact of there being a close time as well as a minimum size, below which it is illegal to capture these crustaceans. The capture of Lobsters during late years has been at the rate of about eleven millions in each season, from which the fisher folks derive a sum of nearly twenty thousand pounds per annum. Various attempts which have been made to "breed" the Lobsters in the Fiords of Norway have hitherto proved unsuccessful,—or are believed to have been so, in consequence of the mysterious disappearance of the young animals, no one can tell how, nor can a trace be found of where they go to. The Norwegian Lobster is the very finest fish of the kind that is brought to market, Oysters once abundant, are now as scarce in Norway as anywhere else. A quarter of a century ago, a hundred or more of these fine molluscs could be purchased for sixpence, now it is scarcely an exaggeration to say that Oysters cost about sixpence each!

It is instructive to examine the tables of exports of Norwegian produce to see how varied they are. If proof were derived of how "fishy" Norway is, it would be supplied by these tables, which include the skins of the seal and walrus, as also whale bones and walrus teeth, fish guano, seal and whale blubber, fish oil and various other products, not to speak of the thousands of

tons of salted and dried cod-fish as well as of cured and smoked herrings, pickled sprats and fresh salmon. In the course of the six years ending with 1881 the value of the fishery products exported reached the sum of 270,458,300 kroners (18'2 to the £ sterling). The "fishy" produce of Norway is mostly cured before exportation. That is a matter which cannot be helped, it would not pay the fishermen to fish much in the summer season, or for the fresh fish markets—the distances are so great and the competition so keen, whilst lots of fish are spoiled or hashed and the danger of a glut in the markets has also to be encountered. The Norwegian fishery economists are anxious to send us their cured cod "klip fish" and "stock fish," and they maintain that if English cooks knew how to prepare these productions, they would be able to provide a dinner for five persons for the small sum of one penny. There is now exported from Norway to Spain, Italy, and other countries about 600,000 tons of cured fish, all of which is converted into excellent food.

Although the fisheries of Sweden are not what they might be, they are, I understand, being constantly improved and developed. The value of the Swedish fisheries has been summed up in the following figures :—

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|---------------------|-----|-----|-----|-------------------|
| Herring and Sprat, | ... | ... | ... | 3,065,000 Kroners |
| Salmon, ... | ... | ... | ... | 625,000 " |
| Eels, ... | ... | ... | ... | 150,000 " |
| Coast and Sea, ... | ... | ... | ... | 2,000,000 " |
| Lake Fisheries, ... | ... | ... | ... | 3,000,000 " |

NOTES ON FAR AWAY FISHERIES.

Chinese Fisheries—The Fisheries of Japan—The Pearl Harvest.

IN other countries than our own there are fisheries for other fishes than the cod and herring or the hake and haddock, and I propose therefore briefly to glance at some of the fishing industries of far away places such as India, China, and Japan. I am not personally acquainted with the fisheries of these countries, never having visited them, but ample materials exist from which to compile a few readable notes respecting the fish harvests of foreign seas, and the various fishes which are caught and eaten, the very appearance of many of which would horrify people whose delight is in sole and salmon, and verify the saying of the old Scotch woman who excused differences of opinion by asserting that some folks like parritch to their breakfast, whilst others preferred puddocks.

No part of the Great International Fishery Exhibition held in London two years ago, was more charming, or attracted more attention than that devoted to China, and when one comes to enquire there is really much that is interesting about the fishery economy of the celestials. The hereditary fisher folk of that country are to the full as peculiar as those of Scotland or Cornwall. The Chinese fishermen are strong and well able to work, and, as a rule, they lead laborious lives. Of course, like all their kind they are superstitious, believing in signs and omens they make offerings to the gods in the hope of earning their protection in times of danger, these take the shape of models of boats and rigging, and are deposited in the temples to which the men resort before sailing to implore the gods to bless their hauls of fish and protect their fishing craft.

From the "Yellow book" which was on sale in the exhibition, I have gleaned the following information as to the the leading points in the fishery economy of the Chinese.

For centuries past fish has been to the Chinese, if not the very staff of life itself, an important element in their commissariat, together with a small portion of rice, it constitutes the staple of their daily food. The fishing venue of China is exceedingly

large, the coast line is extensive and varied ; islands are numerous, and swift running streams and lakes abounding with fish, as also canals populous with finny inhabitants tempt the Chinese to try their fortune in the fisheries. It will be quite impossible to do more, in the few pages that can be devoted to "far away fisheries," than mention the fishery economy of one or two places, and as the Province of Swatow and the vast estuary of the river Han were especially represented at South Kensington, the following notes have reference to the province in question.

Premising that the modes of fishing now in use in China, are exceedingly simple and that the fishing gear used is remarkably ingenious, I have to state that the fishermen are not in any way hampered by vexatious restrictions of any kind, no barriers impede access to the fishing grounds and the work goes on all the year round. Each fishing boat however, is registered, and at certain periods its owner has a tax to pay for the privilege of using it. The boats are divided into classes, so many "pairs" to each, and the licensing fee varies with the size of the vessels licensed. The first payment is say 36 or 30 dollars, and every five years there is a renewal tax of as much in some cases as 10 dollars. There are other payments as well, small sums have for instance to be paid as tea money. Further the fishermen have to pay annually two and a half dollars as fishing tax, as well as an additional sum of 4 or 5 dollars whenever the local yamen officials are changed. At Tatapou and other fishing places, the larger boats always go out to sea in pairs dragging the net, a long trawl between them. At night incense sticks are lighted, with which guiding signals are made so that the boats are able to steer clear of each other. The island of Namoa fishers follow a different plan, they pursue their calling in groups of two large boats and over 40 small ones, to the big boats is entrusted the working of the nets, the little ones assisting, the following being the usual plan of operations. "As soon as the nets are thrown out, the small boats form a vast enclosure round them (*i.e.*, the big ones) the sailors striking on bamboo poles, to rouse the fish from their retreat, and drive them into the net. On a given signal, the small boats gradually pull nearer the centre, and then the net is hauled up. By the noise of the sailors sea birds are attracted, and the moment the net is raised they cluster round it to snap a morsel from the haul." In the fishing, flags are used as signals during the day, at night lanterns affixed to the mast-head serve the same purpose. Different companies of fishers

have different marks on their sails, painted conspicuously in black, so that the boats can be distinguished at a great distance.

Very large quantities of cuttle fish are captured by the Chinese fishermen, during three months of the year the taking of that particular fish forms the chief industry of the fisher folks. There is much that is curious in the arrangements made for the cuttle fish fishery. In China boats can be rented, a given percentage of the proceeds being paid for the use of each vessel. Out of every 10,000 cash obtained by a boat at Tatapou 18,00 cash are paid for the rent of the boat and net. Various other payments have to be made, namely, 250 cash to the fund for sacrificial purposes, 300 for the hire of Coolie assistants, 400 to the helmsman; the remainder of the sum being divided into two equal parts, one of which goes to the master, the other to the men. At different fishing places different practices prevail in money matters, but "sharing" seems to be the order of the day in all the varied enterprizes. Some of the companies take thirty per cent. of the sum realised by their fleets, first of all, however, paying for the rations of the men employed. In the Swatow district there will be about thirteen thousand fishermen, these persons have no benefit societies in which to insure against accident or other contingency.

Cuttle fish are sought after for a period of six months, but are most abundant during June, July, and August. They are taken both by means of nets and hooks. When the season is a wet one these fish are brought at once to market, but during fine weather they are cured in the sun, that is to say, they are cut open and being eviscerated are dried on a mat made of bamboos. When quite dry and ready for the process, they are carefully trodden into wooden tubs by the aid of human feet, the price varies between 20 and 30 dollars according to season. Jelly fish when caught and dried are also a marketable commodity. Sharks also are utilised, the fins are esteemed as a delicacy of the table, and are utilised in the making of gelatine. Eels from river and sea are obtained in large quantities. Shells are dug for and obtained in vast profusion, under the soft ground of the sea and river. Here the supply seems inexhaustible, this industry of shell-digging has been worked with great success for many years. The shells are burned into lime in kilns erected for that purpose.

Oyster cultivation has been carried on in the Province of Swatow for generations past. The plan adopted is exceedingly simple; stones are laid out on the oyster bottom, old oysters are

placed upon them, and spat deposited, in three years the molluscs are ready to gather for the market. The Chinese oysters are described as being rather insipid. The shells are utilised by being burnt for lime. For the "curing" of fish the most important article is, of course, salt. This is largely obtained throughout China by means of a process of evaporation peculiar to the country.

"Fish ponds are met with all over this district (Swatow), and seem to give a profitable return to the owners. The ponds are always dug in shady places and are not made very deep. On the bottom a small excavation must be dug, where the fish can retreat in cold weather. The sides of the ponds are always rough, for it is the general belief among the owners that the fish would not grow in a pond the sides of which were smooth. Around them trees having a large foliage are generally grown, and rockeries are built within to afford hiding places to the small fish. In the early spring the fish ascend the rivers and canals for spawning. They deposit their eggs on the grass and herbs near the shore and after a very short time the young fry come out of the egg. The fry are caught with a very fine net, and first deposited in a tank where they are fed with the yolk of egg. When they have grown a little they are transferred to the pond, where they are kept until large enough to be disposed off in the market. During the first period of their growth the fish require very great care and attention, and everything has to be avoided which might interfere with their developement. Their food consists of grass, which is cut from the border of the ponds. Around the ponds no plants must be grown which might pollute the water, and the washing of vegetables or other articles in them must be carefully avoided. In winter when the temperature of the water has cooled to such a degree that it gets detrimental to the fish, earthen stoves are suspended above the surface to warm the water."—*Special Catalogue of the Chinese Collection of Exhibits for the International Fisheries Exhibition*. London: 1883.

In the Pacific and Eastern seas an animal that is scarcely known in this country is extensively captured for the food uses of the people. I allude to the Trepang or Beche-de-mer, which may perhaps be best described as a sea slug, and is rather ugly looking, not unlike a cucumber covered with prickly points. There is a numerous family of them, but only some half dozen kinds are of any great edible importance. I have never tasted

this animal myself, but I understand it is palatable, and persons who have eaten it say it is excellent, especially when converted into soup. Quantities of the Beche-de-mer are *cured* for export, and in manipulating these, great care must be observed. The process of curing is as follows :—First gut the fish, then boil them, after which they require to be well washed : next they are dried over fires, in all of which processes the most careful handling is necessary. I have seen specimens of this article in the British Museum, the price of the *cured* fish runs high, from twenty to forty pounds per ton.

The seas of Japan, as well as the inland waters of that country, teem with fish and nearly all the Japanese people live on them ; crustaceans and mollusca of various kinds are also abundant, whilst various edible sea weeds help to replenish large food supplies necessary to a vast population. Salt also is produced in large quantities. In the year 1881, 910,331,833 *kin*, of this highly prized material was utilized. One, *kin* it may be stated, is equal to English 1.32377 lb. Not counting either the salt or sea weed the cured fish of Japan and Yedo (excluding other dependencies) amounted in round numbers to two hundred and eighty-seven millions *kin*. The fish eaten fresh and fresh water fish, are not included in the above computation, which includes herrings, sardines, sea ear, shrimps, cuttle fish and Beche-de-mer. As fish is consumed in greater quantities fresh than in any other state, the total consumption is estimated to be something enormous, seeing that there are thirty six millions of persons to feed, a full half of the number using fish oftener than once every day. To obtain this food stuff requires 1,530,795 fishermen with 187,220 fishing boats. Mr. Okoshi a member of the Japanese consulate in London, estimates the catch of fish in the seas of Japan to be 2,500,000 tons per annum, as against the 550,000 tons taken in British waters by the 114,000 fishermen of the United Kingdom. The cuttle fish is largely eaten by the Japanese people, and turbot, sole, and tunny fish are greatly esteemed, as also the sea bream. The fresh water eel is a favourite with all, and in Tokio there are thousands of restaurants or "eel houses," in which this is the fish principally served. Says Mr. Okoshi, "the dish most in vogue is composed of eels grilled with sauce. In England eels are cut in small pieces, and generally stewed or fried ; but in Japan they are, while alive, cut into two along the back, but leaving the skin attached, and the bones are taken away, so as to leave skin and

flesh when they are prepared. With what quickness, skill, and dexterity this part of their preparation is executed in the eel houses is almost inconceivable. The man who does this work does no other part of the cooking; another man prepares them with bamboo skewers for being grilled; a third man does the next part of the work, and so forth; there is a real division of labour."

The plan of capturing the Octopus in Japan is worthy of being mentioned. This curious fish is taken by means of a long cord. It is usually several miles in length, and is laid along the bottom of the sea; at intervals branch lines are attached, and at the end of these are hung artificial pots. The fish, which likes to attach itself to some sort of holding on place, eagerly takes possession of these receptacles, in which they are captured; as when every five or six days the pots are drawn up to be examined, they stick fast to their coign of vantage as they doubtless think it, and so they are caught. Sea bream, mackarel, and tunny fish, are plentifully obtained in the waters of Japan, and are much used as food. The culture of fresh water fish has been carried on by the Japanese for centuries. Gold-fish in particular are extensively grown, and now I believe several other kinds of fish are in course of being introduced both for public and private fishing. In various districts of the country there are private ponds plentifully stocked with several kinds of fish, in which, by payment of a fee, one can fish by the hour or the day. Cured fish are now exported from Japan, that branch of industry having been recently entered upon. I had almost forgotten to mention that an extensive fishery for cod is also carried on in Japanese waters, in the North the capture of over 400 of these fine fish is taken per boat per day. It may also be mentioned that different kinds of sea weeds are largely consumed by the intelligent inhabitants of Japan.

The wealth of the waters away in the far East is exemplified by the pearl fishery, which is both picturesque and productive. The following is an extract from a paper on "the Pearl Harvest," contributed by the author of this work to a popular periodical some years since; it contains matter which is still of interest, as the *modus operandi* of the fishery for that gem of the sea never changes.

The pearl-mussel is said to be in its finest condition as a pearl-producer when it attains its seventh year; in fact, that year seems to be a culminating period for it. In mussels which live

beyond that age, the pearl is found to deteriorate in value ; but it is thought by those who have had good opportunities for observation, that the pearls of the seventh year are of double the value of those which are contained in six-year-old-shells. As to the effect of accumulating age on the value of these gems, we have some authentic knowledge. The cholera morbus having broken out during the Ceylon fishery of 1829, the diving was brought to a premature termination ; and in March of the following year, when diving was resumed, the pearls proved to be greatly increased in size, and the fishery yielded at least £15,000 above what was expected.

Pearls of any commercial value are not found in shells that are younger than four years ; the young mussels, *i.e.* those of about four years old, have pearls of a yellow tinge, whilst the produce of the old oyster is of a pinky hue : but pearls are found of many hues, some of them being red, others quite black. Tastes differ about the colour of pearls. The dealers of Bagdad prefer the round white pearl, whilst at Bombay those of yellow hue and perfect sphericity are preferred ; others again choose their pearls of a rich pinky colour. It is a popular idea that the deeper the water the finer the pearl ; but this, like many other popular ideas, is erroneous ; the mussels, for instance, that are found on the banks at Arippe, are famed for their beauty, but the beds of shells there are not nearly so deep as some others that are found in the Indian seas. One observer says that the best pearls are found in five or six fathoms water.

In a report on the pearl-fisheries of the Persian Gulf made by Colonel Pelly to the Government of Bombay, we learn that the best oyster-beds in the Persian seas are level, and formed of fine whitish sand overlaying the coral in clear water. Any mixture of mud or earthy substance with the sand is considered to be detrimental to the pearl-fish, as at home it is thought to be to the edible oyster, and such beds as have this defect are liable to exhaustion. As regards the fisheries of Ceylon, we are told that large quantities of the mussels are found clinging together, that they can sometimes be gathered in great strings called cables, and that the divers have much difficulty in separating the shells : also that very often the thickness of a bed amounts to several feet. Indeed, some divers are of opinion that many of the banks are crowded with oysters to the height of a man, only those at the top being alive. Yet, in the face of this, we are assured that whole colonies of the pearl-mussel have fled away to new beds.

It has been told to me by persons who have recently inspected the banks, that dead mussels were found in large quantities; some say that the mussels on these banks were killed by a species of skate that preys upon them,—others are inclined to assign other causes for the mortality. Have these beds of dead mussels been examined? Could not they—were the dredge in use—be brought to the surface, and the pearls be taken from them? And on all the beds where the oysters have died out, or decayed from some unknown cause, are there not countless pearls lying wasting in the waters? and might not these be obtained by dredging over the ground with the same kind of instrument that we employ in dredging the Clyde or the Thames? The outer skin of such pearls might be dull, but they could be peeled; for the gem is made up, like an onion, of so many layers, and a dull pearl can sometimes be peeled into a bright one.

In the days when there was a pearl harvest to gather in the waters around Ceylon, the following was the mode of gathering it:—Before a fishery could be authorized, it was considered necessary to make a survey of the various banks, in order to determine which of them should be fished—as it was never usual to permit indiscriminate fishing, or to fish each bank annually. During the course of the survey, a few thousand oysters—usually from three to five thousand—are gathered as a sample from which to estimate the probable produce of the beds determined to be fished. The shells being carried to Colombo, and the washing away of the meat being accomplished, the sample of pearls thus obtained is submitted to a committee of experts, generally Moormen, in order to be valued. As to be appointed a member of this committee is thought a high honour, there is reason to believe that an honest verdict is usually returned.

When the report of the experts is given in, those in power then decide whether or not to hold a fishery, of which, when a fishery is determined on, due public notice is given by advertisement, stating on which of the many pearl-banks the fishery will take place, the number of boats that will be allowed to fish, and the number of days the fishery will last, all of which matters are carefully settled beforehand. If the fishery is to be conducted on account of the Government, the advertisement says so, and announces that the oysters (they are always called oysters) will be put up for sale in such lots as may be deemed expedient; if, on the other hand, the fishery is to be open to speculators, it is

then announced that tenders will be received from such persons as may be desirous of becoming purchasers of the whole right of that particular fishery.

These preliminary matters have been all satisfactorily arranged, the boats that are to take part in the fishery come on the scene, and these are just the one-masted boats in common use all round the coast as carrying and fishing boats, and they may range from six to ten tons burden. On the advertisement announcing that a fishery will be held being published, a great many more boats usually apply than can be employed, and bribes are frequently given in order to obtain a preference. We have seen a complaint from Twandle Swany, a native boat-owner, who having paid 120 rupees for getting his boat appointed, was dismissed after fishing for seven days, his take averaging about 25,000 oysters per day—a hard case for so good a somnatty. Each boat employed in pearl-gathering requires altogether a crew of twenty-three persons to work it efficiently. Ten of the number are divers, two men to each stone, and five stones to each boat; other ten of the crew are rowers, and attend on the divers when the boat is on the bank. The remainder of the number are the tindal, or master, who acts as steersman; the somnatty, or owner; and a toda, or baler-out of the water. A peculiarity of the pearl-fishery is that every person connected with it, as in some of our home fisheries, is paid in kind.

When the government engage the boats to carry on a fishery, it claims three-fourths of all the shells brought on shore; and when a speculator, as is sometimes the case, has contracted to pay a certain sum to Government, and so takes the risk of the entire fishery, he claims the same allowance, or more if he can get it. Out of the remaining fourth of the produce a great many deductions have to be made before the boat-owners obtain their chance of payment, which is also made in this universal shell-currency. For instance, many of the Government officials were at one time remunerated by a percentage of the capture, namely, two oysters from each stone; a similar allowance being made to that important personage the shark-charmer, without whose presence no fishery can proceed. Then, besides these, charity oysters have to be given for the Hindoo temples; indeed, some of the temples were at one time allowed the privilege of having a boat at some of the fisheries. After all the deductions have been made, the diver, who sustains the most laborious occupation in connection with the fishery, may obtain 134 oysters out of

every 2,000 he brings up, as his own share : in sober money, he just earns about nine shillings per day ; and he and the rowers only obtain a share on five days out of the six. On the sixth day the master gives the crew no pay at all, in order to swell his own gains.

The *modus operandi* of pearl-fishing has been so often described that there is no occasion for again going over the general details of how these gems are procured, except in so far as I may correct some of those inaccuracies which have been so frequently repeated in the stereotyped accounts published in many of our school-books, and at the same time consider whether or not the use of the common oyster-dredge may not be recommended as a substitute for the diver. After a fishery has been determined upon, and the boats have been engaged, licensed—for which a small fee is charged—and numbered, the commencement of active operations is often delayed on account of unsuitable weather, generally because of a north-east wind blowing from the shore, whilst the proper wind for the fishery is a breeze blowing from the sea, sufficiently powerful to carry the boats to the shore. This is ascertained by the experiment of making a boat go out once or twice. When the wind is strong enough to blow her right inshore, then the fishery begins, a lucky day being selected by the natives for the commencement. The start of the fishery is usually in the beginning of March. Before that time the bank which is to be fished is marked with flags. At the commencement of the fishery a signal gun is fired at midnight, when the fleet immediately sets sail—the *ardapanaars*, or headmen, of the fisher caste leading the way with a light shining, as a guide to those who follow ; a light is also shown at intervals by the Government guard-ship. Starting at so early an hour, the boats reach the vessel long before daylight, and they are required to anchor till they can see to fish. Soon after sunrise a signal gun directs the fleet to proceed to the fishing ground, and at half past six the hoisting of a flag permits the divers to begin their labours. Immediately five or six hundred naked swarthy figures plunge into the tranquil waters. Active operations are usually carried on for six hours, the divers descending into and rising from the water with great regularity.

Each boat is furnished with five diving stones, with a complement of two divers to each stone. The divers belonging to each stone go down time about : while one is down the other is breathing and resting. Divers are generally of the Parawa caste,

from the coasts of Madura, Jaffna, and Manaar, and the pearl-fishery is in a sense a recreation for them, in the same way as a boat-race is recreation for the Thames watermen.

The shark-charmer, a cunning person, who is considered so indispensable to the fishery that he is paid by Government, is constantly at the fishing-bank. At one time, the charmer used to be allowed a per centage of one oyster per day from each diver, but this has been commuted into a money payment. Accidents have never been known to occur on the pearl-banks from sharks, which is of course attributed by the superstitious natives to the wise charming of the charmer; but it is quite easy to suppose that the noise made by so many divers frightens away these ferocious monsters. Exaggerated stories have been told of the time that a pearl-diver can remain under water, two minutes and even three having been mentioned as the common time, but fifty seconds is the usual period when the men are regularly at work; instances have, however, been frequent of an immersion lasting for eighty and even eighty-seven seconds. The divers enter strenuously into their work, and a good hand will, when the mussels are plentiful, send up as many as three thousand in the course of the six hours he is on the pearl-ground. At a given signal the fishery ceases for the day; then the crews which have been lucky shout for joy, others who have obtained but a scant supply linger on the bank till driven away by the guards. If the breeze be not strong enough to carry the boats to the shore, the men have to take the oars and row them home.

Meantime the boat-owner has been in utter anxiety to know what luck his boat has had, and the moment the little vessel reaches the shore he springs forward to ascertain the result of the day's diving, and to look over and fondle the wealth-giving shells. Others, all who are speculating in the fishery, are quite as anxious about the day's take; and the fact is, that the thousands of people who gather on the coast—and they are so numerous that it looks as if a large town had suddenly been set down by the sea-side—are more or less speculators in the fishery: it is one great lottery. All kinds of people are assembled, and they are from all countries, and are of all colours, of many castes and of very different occupations; they erect with great rapidity tents, huts, bazaars, and shops; there are sutlers, jewellers, and merchants of all kinds on the scene, the grand idea being there as everywhere else; to make money. Everbody speculates, from the wealthy Hindoo merchant, who buys the right of fishing,

down to the humblest outcast—for there are questionable characters of all kinds to be seen around, monks, fakirs, beggars, and the like. Strokes of luck are constantly being announced; a poor man may buy a fanam's worth of shells, and find himself in consequence of his purchase in possession of a little fortune. One person at a recent fishery bought three shells for a sum which could be represented by twopence of our money, and in one of the shells he found the largest pearl of that year's fishing. A pearl-fishery is as exciting to the natives of the East as the Derby or the Leger is to a Londoner.

When the fleet arrives with the mussels, they are all carried ashore and are divided into four heaps, three of which are selected by Government when the fishery is carried on by the executive, the other being the property of the boat-owners, and falling, as has been already explained, to be divided amongst the divers, rowers, and others. The shells are exposed in heaps or in pits, so that the pearls might be rotted out of them—the flesh of the fish is never eaten except by very low-caste natives—they are kept till the end of the fishery and then placed in canoes to be washed; poor buyers, however, cannot afford to wait, but seek out the pearls at once, at a considerable loss. Every individual shell is carefully washed and examined, and the pearls picked out, and afterwards the canoe itself is submitted to a series of washings in order to find out such pearls as may have escaped observation. These are usually found among the sand, children being employed to give a last look over the débris, in order that their young eyes may pick out the small seed-pearls which are sure to escape the eyes of the older people. The pearls are assorted into ten or twelve sizes by being riddled through a series of perforated brass saucers or colanders fitting closely into each other, the first of which has twenty holes in it, and those pearls which do not escape from it are called of the twentieth basket. The other baskets have each an increasing number of holes, thirty, eighty, one hundred, and progressing to a thousand perforations; each basket, of course, giving its name to the gems it contains, as pearls of the fiftieth basket, and so on. The price of the pearls is fixed per "chow," a local term which gathers into one word, size, form, colour, and weight, thus enabling the quality to be appraised.

As to the yield of pearls, it may be stated that it is most uncertain: as many as one hundred pearls of various sizes have been found in one shell, and oftentimes a hundred and fifty

shells may be opened and not one pearl be seen. The largest pearls are said to be found in the beard of the animal. The estimate of the shells taken up for the samples previous to a fishery being announced, will average from ten to thirty Madras rupees per thousand oysters. Frauds of all kinds are constantly being perpetrated: mock pearls are mixed with genuine ones, and an endless variety of thefts is committed; the coolies will swallow the gems, and the women will carry them away in their hair. The natives are very dexterous in picking out the pearls from the freshly taken shells, and also in concealing them. Plots are made up by the boat-owners and others to cheat their employers. When a man obtains the chance of stealing a large pearl, he contrives to signal to a confederate, who will, upon getting the hint, ostentatiously steal a small gem in order to throw the watchers off the scent: the small theft is at once detected, an uproar ensues, due punishment is meted out to the culprit, and during the time that this little drama is being enacted the "big thief" contrives effectually to conceal the treasure which he has purloined.

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A FEW WORDS ABOUT FISH AS FOOD.

Cost of Fish—Former repugnance to Fish as Diet—Cheap Fish Supplies—Experiments—Fishes which are good for Food—Ancient Fish Dinners—A Fish-loving Queen—Value of Fish as Food—A Fish Dinner Experiment—Fish as a Food Variety—Fish in time of Lent.

THERE has of late been a tendency—it dates from the time of the London Fishery Exhibition—to overrate the value of fish as food, and the nation has been gravely counselled to “eat more fish and less flesh,” so as to reduce the price of butcher meat, and bring those who deal in “roasts and boils,” or “steaks and chops,” to their senses ; but no augmentation of our fish supplies, however large, seems to affect the tariff of the cattle-men, and, to speak the truth, several of the food products of the sea are relatively much dearer than either good roast beef or mutton. As all the world knows, the worth of an article is just what it will fetch whether it be “fish, flesh, or fowl;” an egg, for instance, contains much more “meat” than an oyster : but for all that, a fresh oyster costs much more than a new-laid egg. The price which has now to be paid for turbot, soles, and salmon by the general public must prevent anything like what may be called “popular consumption,” in the sense of reducing the butchers’ bill, while the present demand for the commoner sorts of fish can only be partially met. At times it is, of course, impossible to proceed to sea, and so the stock speedily becomes exhausted. Now, were our fish supplies to be greatly augmented, would prices fall to any perceptible extent? An ever-increasing population and rapidly extending facilities of distribution forbid the indulgence of that hope. On certain occasions throughout the year when markets become glutted with the commoner kinds of fish, prices fall to a figure more or less nominal, but what is remarkable on the occasion of such gluts is, that however large the supply may be, it can be readily disposed of. On a particular day some few years ago the salesmen of Billingsgate were, as one of them said, “flabbergasted” by the arrival of such a gigantic consignment of herrings as had never during any previous season been seen in the market, but long before night every fish was sold!

The repugnance at one time shown to this kind of food by the working classes was somewhat remarkable. For a long period they declined to purchase fish, nor could some of them be prevailed upon to eat it when it was *given* to them; and had butcher meat continued cheap, fish also would have been cheap, because the demand for that description of food would not have become so urgent as it is at present.

In the time of King Edward the First soles were ordered to be sold at threepence per dozen; smelts were offered at the rate of 100 for a penny, mackerel were a penny each, a big turbot cost sixpence, a large cod-fish was sold for 3d, and oysters for sauce might be had at 2d per gallon! In the beginning of the present century prices had risen considerably, but even then were nothing to what they are now. Soles at that date sold at 5d per lb. weight, cod at 1d per pound more than that. A small turbot could be bought for 5s, a ling was the same price; smelts had risen to thirty times the price paid for them in the time of King Edward, and oysters were thought cheap at 12s per bushel. Readers may contrast those figures with the prices of to-day, when a turbot of moderate dimensions costs a guinea, and oysters are thought cheap at half-a-crown per dozen! Salmon brings 3s a pound at certain times of the year. A very small whiting costs a sixpence or a shilling in the shop of a fish merchant, and a sizeable cod-fish at Christmas cannot be bought in London much under a sovereign.

In glancing over some old information about fish food I have been greatly struck by the anxiety shown by various benevolent persons to "have the poorer classes eat fish, a food stuff at once so plentiful and cheap." Such efforts are not now required, because all classes eat as much fish as they are able to purchase, and would willingly eat much more if they could obtain it at a moderate price. About the beginning of the present century, strong appeals were from time to time addressed to the working classes in order to encourage them to live more upon fish than they were in the habit of doing.

One enthusiast says:—"I cannot help looking forward with confidence to the day when the fish of our streams, and especially those of the ocean which 'murmurs round our rocks,' will contribute much more largely than it now does to supply a well-ascertained want of the people of England." One circumstance that must, in some degree, have prevented fish from becoming popular as food for the people is the fact that 50 years

ago it was difficult to procure it fresh, and of all foods fish-food requires to be eaten in season. As regards the mackerel, for instance, it is said that it begins to deteriorate the moment it is abstracted from the water. Doubtless the people living half a century ago had their taste for such diet spoiled by partaking of fish that had begun to decompose by reason of the delay which occurred in transit, or had been badly cooked. No food is more susceptible of the arts of the cook than that composed of fish. A clever cook can "confection" such whitebait out of a little flour and gum as cannot be distinguished from the real fish, and, in America, excellent artificial oysters may, it is said, be purchased all the year round!

Another circumstance that perhaps prevented fish from becoming a popular "people's diet" is well illustrated by the old housewives' proverb, which says that "when fish is bought it is only half bought," the meaning of which proverb is that all fish requires a great deal of what Scotch people call "kitchen"—that is, oil or butter—to render it palatable; and that, therefore, when the price of the butter or other kind of fat is added to the cost of the fish the total sum is comparatively large. Sea fish in particular stand eminently in need of the warming qualities of supplied fat. But when fish forms one of the courses of a liberally-furnished table—where there are fat meats of many kinds—then oily sauces should be very sparingly added. No oil or butter is required with salmon, for instance. A cod-fish, on the contrary, requires a well-filled butter-boat to be placed within reach of those who are eating it; and others of our sea fishes ought to be well lubricated with oily sauces; in truth, the cookery of many kinds of fish is very expensive. Ling fried with a few morsels of bacon is a device of the humbler order of cooks, in order to provide a dainty dish, and many such devices require to be resorted to in fish-cookery.

It may prove interesting to mention one or two of the schemes which some sixty years since were successfully set on foot to popularise fish as food.

On the 15th of June, 1812, by a preconcerted arrangement, 17,000 mackerel were sold in Spitalfields at a penny each! These fish had been contracted for by Mr. Hale, a member of a committee which existed at that date for the relief of the manufacturing poor. That gentleman made an agreement with certain salesmen to purchase from ten to twenty thousand of these fish every day at the price of 10s for each 120. The

experiment, by reason of the necessitous state of the people, was immediately successful, as many as 500,000 of these very palatable fish having been disposed of to the poor of London in one week. The total cost of carrying on the experiment for a considerable time amounted only to £50, that sum being expended in organising the distribution of the fish.

At Sheffield during a period of distress, the same committee, of which Mr. Hale was so active a member, sold upon one occasion 200 tons of salted cod-fish and 400,000 cured herrings—the cod-fish being sold at $2\frac{1}{2}$ d a pound, whilst the herrings were disposed of at two for $1\frac{1}{2}$ d, and the poor people were very glad to have such wholesome “kitchen” to their potatoes. Another of the same series of experiments was the entering into a contract for the purchase of all the fresh fish and corned cod that could for a time be brought from the North Sea and Iceland fisheries, as much as £18 a ton being given for the supply. A considerable quantity was obtained: in the first instance, 100 tons of salted fish and 50 tons of fresh cod. In all 1650 tons of various fishes were bought and distributed. At £18 per ton, which was the contract price, the retail cost of the fish would be about 2d per pound weight.

It is now sixty years since these experiments, born of sad necessity, were tried, but the prejudice which prevailed among the working classes in England against a fish diet were slow to overcome, and it was not till many years after that the “common people,” as they have been called, took kindly to fish-eating. Many of even the most intelligent of the working class thought it *infra dig.* to eat fish, considering it a kind of charity diet, and, therefore, they looked askance at it. An intelligent and wealthy tradesman has told us that when a boy he cried the whole of one Sunday afternoon “because mother had only a dish of baked mackerel for dinner.” Perhaps the working classes of these days had read that the term of “ichthyophagy” was applied more as a reproach than a description to nations that lived altogether or mostly on fish. Before the date of the following experiment the prejudice against fish on the part of the working classes was wearing out, although there is even to-day a lingering distaste among the class to have too frequent recourse to fish food.

Early in the year 1842 a fishing company opened a shop in Manchester for the sale of fish caught by them on the Yorkshire coast. Large quantities were taken, which within twenty-four hours

were on sale in their newly-opened shop. The experiment was begun on a Saturday afternoon, and such was the demand for the fine fresh fish which were on sale, that within two hours the whole supply—which amounted to 3192lb. weight—was sold off at the rate of two shillings per stone, or less than twopence per pound weight! On the Monday and Tuesday following the sale was equally brisk, the whole take being sold within a couple of hours at the same price. Manchester would, we dare say, be very glad to have another series of such chances at the present time; but the fish of the period, although brought to our markets in very large quantities, cannot be purchased at such prices, for the greater the demand becomes the higher becomes the price.

Fish have always played an important part in the commissariat of nations, and curiously enough the same notions, have always prevailed as to the wonders that might be affected by rendering it still more plentiful than it ever was known to be. It is a fashion with certain economists to keep iterating that we do not draw on our sea food supplies to the extent we might do; and it is still more a fashion to have always certain fishes in the market which bring tancy prices. The turbot and the whitebait may be instanced as examples of the rage which prevails for "creating" expensive fish. In this the example was set us many hundred years ago. The classic epicures gloated over their red and striped mullet, the same as the gourmets of to-day may be supposed to gloat over their turbot fins or "the thin" of the salmon. But although both of the fishes just mentioned rule high in price at all times—salmon being at certain seasons of the year sold at five shillings per pound weight, besides being mostly throughout the period of the year during which it is in season dearer than the choicest cuts of beef or the best gigots of mutton. A guinea for a cod fish and the oysters to serve as sauce to it, has not of late winters been an uncommon figure. Turbot is also sold at a very high price; but these fishes cannot compare with mullet at a guinea the ounce, as Juvenal says:—

" ——— the lavish
Six thousand pieces for a mullet gave,
A sesterce for each pound."

The particular mullet alluded to cost a sum of £48 8s 9d. of British money. According to Pliny, a consul named Asinius Celer paid upwards of £64 for a single fish of this kind.

Let us now take a glance at those fishes which are are "good

for food," and we shall begin with that which is esteemed the commonest of all, namely—the herring. It is supplied to us in almost incredible quantities—millions!—and at a comparatively cheap price, although not so cheap as we can remember it to have been sold about a quarter of a century since, when "herrings, three a penny!" was a common enough street call. Now-a-days herrings are considered cheap when they can be procured at the schoolboy-puzzle price of "a herring and a half for three bawbees, how many is that for elevenpence?" The herring is in its prime when its roe or milt is about two-fifths developed, and whether boiled fresh or broiled on a girdiron is exceedingly palatable. Herrings should be broiled in pairs—gut, clean, and split them up, sprinkle them plentifully with good round oatmeal, then place them together, with their backs only exposed to the action of the fire which should be as clear and smokeless as possible. Two minutes will do each side. Fresh herrings can be potted or stewed in a little weak vinegar and water for a breakfast dish, to be eaten cold of course. Cooked in that way they are excellent. A salt herring boiled on the top of the potatoes to which it is to serve as kitchen is excellent, and is a favourite dish of the Scottish peasantry and working class. Other members of the *Clupea* family contribute to the national commissariat, in particular the sprat, which affords many a toothsome fry in the winter season, when that fish can be obtained; but we regret to say that the supply is not so plentiful as it used at one time to be, in consequence of the railways charging so much for the carriage of these fish. The much-prized whitebait is the young of the herring; and the pilchard, which is largely consumed in the south of England, is also one of the family.

One of the numerous fishes which brings a store of wealth to those who engage in its capture is the cod. The cod fish grows in some cases to a very large size; individuals weighing as much as 40 and 50 pounds have been often taken. The usual run of cod fish, however, ranges from about 10 to 18 pounds weight. The cod is a voracious feeder, and very prolific. All the parts of a cod fish can be made use of except the gills, which, however, can be used as bait for the capture of other fishes. The tongue of the animal is carefully cut out when the cod fish is to be cured, and, whether sold fresh or salted, is much esteemed as a delicacy. The sounds or air bladder forms also a palatable dish when preserved in a soft state by salting—they can also be cleaned and dried to make a substitute for isinglass. Then the liver is used

in order to obtain its oil. Who has not heard of the virtues of cod-liver oil or of its importance in medicine?

The ling is a member of the cod fish family, and, for both size, goodness of flavour, and keeping qualities, is a most desirable fish—its flesh is firm and white and of exquisite flavour, and takes on the cure better than any other member of the *Gadidae*. This fish, it may be stated, grows to a large size, a twenty-five pounder being common enough, and the largest fish have undoubtedly the best flavour. The tongue and sounds of the ling are even finer than those of the cod, and its liver yields more oil.

The abounding haddock, whether fresh or smoked, is an excellent table fish, its flesh is very firm, snow white in colour, with a creamy curd between the flakes. The larger the fish is, the firmer it will be, and when convenient it should be boiled in sea water. It is also excellent when it is broiled or cut in pieces and stewed as "fish and sauce." The "finan haddie" is a well-known breakfast delicacy, but difficult to procure genuine, many of the fish sold as Finans being smoked in London, and not well done. The best wood for smoking haddocks is juniper, and it is only experts about the shores of the Moray Firth who can do this part of the business satisfactorily. The whiting, *le merlan* of the French, no doubt so called from the silvery whiteness of its appearance, stands pre-eminent among white fish for tenderness, delicacy, and flavour. It is free from viscosity, and while tolerably nutritious, is very easy of digestion, and therefore adapted to weak stomachs.

The family of the flat fishes yields some fine food fishes, chief of which and first in value is the aldermanic turbot, a fish which in the present day is greatly esteemed as a food delicacy, and appears from the remotest times to have been highly appreciated by cultivated epicures. In the classic days of ancient Rome no feast was perfect at which a turbot did not appear, and the fins then as now were considered to be a *bonne bouch*. The flesh of this fish affords excellent eating; it is rich, creamy, white in colour, very gelatinous, and of excellent flavour, which can be improved by keeping for a day or two, but it should not be kept longer than three days. The skin of this fish when boiled is much esteemed by some *gourmets*: it is rich, pulpy, and gelatinous, but is rather heavy for delicate stomachs. It may just be mentioned that a turbot is best boiled, and it should be served with caper sauce. In helping a turbot it is a point of

honour to give with each helping a little of the fins. A good anecdote *apropos* of this duty of the carver went the round of the newspapers a dozen years ago. A barrister engaged in a certain trial excited the wonder of the judge and all his brethren of the long robe by the unmerciful way in which he cross-examined a certain witness, although nothing that was elicited had any bearing on the case. At dinner, in the evening, the gentleman was brought to book by his brethren at the mess table. "What on earth did you mean by the heckling you gave that witness to-day, and after all it was simply lost time?" "Oh," replied the barrister, "I met that gentleman not very long ago at dinner, when the duty devolved upon him of carving a fine turbot; and would you believe it, gentlemen, the mean fellow did not give me or any other gentleman at table even the smallest morsel of the fin; so I vowed to have my revenge, and to-day I have had it."

There are other members of this family which are equally good for table use, and, indeed, are as highly esteemed—as, for instance, the sole. A pair of soles of about 6lb. weight are a good size for table. The flesh of this fish is tender and agreeable to the taste, and is also easily digested: its many exquisite qualities render it a favourite dish at the tables of the rich. There are numerous other members of the flat fish family, and a fry of small flounders, or, as they are called in Scotland, "fleuks" is not to be despised.

The "Vension of the Waters" is the salmon, which from time immemorial has afforded the chief material for a "kettle of fish." A salmon should be all eaten, the skin being as good for food as the flesh. It may not improve the appearance of the fish to scrape off the scales before it comes to table, but that ought to be done, and then the skin can be eaten with great relish. Salmon should, as a rule, be eaten cold, with a sauce of the water in which it has been boiled, together with a little vinegar and a *soupçon* of mustard; the serving of melted butter and sliced cucumber along with this fish is a blunder, so is lobster sauce. Let the salmon be served in a deep dish (but without the conventional napkin) with a plentiful supply of its own gravy, *i.e.*, the water in which it has been boiled, and then it is at its best, and no fish of the salmon kind is better than a seven pound fish, grilse or not, boiled whole in plenty of well salted water, a portion of the "breoo" being kept with which to help the next boiling! In a Tweed "kettle of fish" the boiling mixture is always preserved to aid in the cooking process of the next feast of the kind. So much for the salmon, which by-the-by, to be

enjoyed in perfection should, when that is possible, be eaten right out of the water. Lord Lovat adopted a capital plan for obtaining "curdy" salmon, as he erected a caldron with boiling water at a "salmon loup" into which the fish precipitated themselves as they made their attempts to gain the upper waters.

Harking back to "the days of old," in order to illustrate the fondness of the ancient peoples for fish, it may be observed at any rate, that the ancient Greeks after a long period of indifference took to the eating of fish with much industry, and the Romans copying them exhibited their regard for the piscine delicacies of the season with still greater emphasis—if we may use such a word—as their love of fish ultimately became quite a passion. Turbots excited their admiration in a high degree, whilst the *muræna* were objects of idol worship. The most distant lands were ransacked to find fish of the most *recherche* kinds, they were imported in pots of honey, and cost enormous sums of money in consequence of the competition of individuals, some of whom were far richer even than kings. Fish, according to Martial, were always sold at ruinous prices to the Roman epicures. Figures which prove this to have been so could easily be quoted—they may be found in the biographical notices of Apicius, Orata, and Lucullus. The stock of fish kept by the latter gentleman was of far more value than a modern herd of fashionably bred shorthorns; when sold it realised the very large sum of £32,000. The fish stock of C. Herrius brought a similar sum. The ordinary costs of the celebrated fish suppers given by Lucullus in the Hall of Apollo was 50,000 drachmas, equal in our money to £1614 11s 8d. At a Roman banquet the fish were weighed alive at table, and to see them expire in the agonies of cooking was deemed high entertainment. It may be mentioned before going farther that the Egyptians used to worship certain fish, and to have them embalmed with a view to their preservation. In spite, too, of the example of their priests, who never touched fish food, the people ate fish raw, in order to save cooking. It was reserved for a woman to set an example in these olden times of how to eat fish with propriety. That woman was Gatis, Queen of Syria. Her Majesty was so fond of fish that, in order to be continually supplied with the best varieties that could be obtained, she gave instructions that all those that were caught in the kingdom should be brought to the Royal Palace, and that no person was to eat such food without her permission. This edict very nearly pro-

duced a rebellion ; at all events, her subjects evinced great dissatisfaction, of which, however, she took no notice, but continued along with privileged friends whom she sometimes condescended to admit to her table, to enjoy the very finest dishes of fishes that her head cook could contrive. These were mostly made up from the flesh of the tunny, the conger eel, and the carp.

Having said all that is necessary about the economy of our fish supplies and about the value of fish in the days of old, I now come to another part of the subject. The question to be most considered in connection with "fish as food," may be thus put—What is its real as distinguished from its money value? If a pound note has to be parted with to secure a turbot, or if half-a-crown per lb. has to be paid for salmon or sole, what are the values of these fishes as a food product in comparison with the quantity of butcher meat for which a similar sum has to be expended? As is well known, beef and mutton, when roasted are subject to a very considerable percentage of waste, and even when boiled, if the water in which they are cooked is not economised by being made into broth. It is not too much to assume that meat, in the cooking process, loses about a fourth of its weight, besides being rendered heavy by its bones. Badly fed beef wastes enormously in the process of roasting, and so does mutton. Many of our best fishes, if we may believe the cook, "boil away to nothing," especially if they are not in their proper season. There are times when fish are not worth the trouble of cooking, and when that kind of food should not be partaken of. Land animals of all kinds are at certain seasons quite unfit for food. Their times of reproduction are here alluded to when the care and affection they bestow on their young seriously deteriorate their bodily structures. It is the same, in a sense, with fish, although the circumstances of their case are somewhat different. At certain seasons all the nourishment they obtain is absorbed in the development of their roe and milt, and yet it is only at the period when some fishes are about to fulfil the grand instinct of their natures that they can be obtained for food purposes.

Many elaborate comparisons have been made as to the comparative food values of butcher meat and fish, and great controversies have arisen on the subject, in which the utmost diversity of opinion has been expressed. Some economic writers maintain that fish have no food value worth speaking of, others say that fish food must occupy a middle position between vegetables and beef or mutton. Again, a learned authority says that fish, well

cooked with oil or fat of some kind, or served with butter when brought to table, "is chemically the same as butcher meat, so far as nutrition is concerned." One writer says that fish as food is only fit for children and invalids, and is totally unfitted to support the health and vigour of men or women who are engaged in laborious occupations. As usual in such disputes, we may hold that the truth lies between the two extremes. Many people following laborious occupations, especially in Scotland live largely upon fish. In that country the fishermen themselves eat a considerable portion, and as a class fishermen are strong and healthy, and their wives, who do a large share of the men's work, are still stronger and healthier. In Portugal, fish, fried in oil, forms a very large proportion of the food of the population. Their fish diet is supplemented by a little bread and fruit, and the peasantry of the land never partake of flesh meat, yet they are a hardy, vigorous, and brave people.

Another point on which there has been a large amount of controversy is in regard to the rigorous observances of the fasts of Lent, and how those who fast with determination feel after their 40 days' penance. One writer says that those who live on a fish diet for that period and observe the 40 days with honesty, take no harm from it, but another of the controversialists is of an opposite opinion, and says that Roman Catholics lose flesh during that period, and deteriorate in health and strength. We can only judge of this fact from seeing the Catholic community of Great Britain. In France, Spain, and other Continental countries, where Roman Catholics constitute the bulk of the population, very little butcher meat, speaking comparatively, is consumed, as the bulk of the population live on a vegetable and farinaceous diet, supplemented with such supplies of fish as can be procured. Indeed, fish has become a necessity of life in France and Spain.

The way of chemists is to divide food substances into water, fibrine, and gelatine, and it will be seen from the following statement of three kinds of butcher meat and three fishes what relation the two food elements bear to each other.

| 100 Parts of Muscle of | Water. | Albumen or Fibrine. | Gelatine. | Total of Nutritive Matter. |
|------------------------------|--------|---------------------------|-----------|----------------------------------|
| Mutton..... | 71 | 22 | 7 | 29 |
| Chicken | 73 | 20 | 7 | 27 |
| Beef | 74 | 20 | 6 | 26 |
| Cod | 79 | 14 | 7 | 21 |
| Sole | 79 | 15 | 6 | 21 |
| Haddock | 82 | 13 | 5 | 18 |

The salmon, it may be stated, contains 78 parts of water or fibrine to 22 of fat, whilst the eel has no less than 56 parts of fat to 44 of water and fibrine. Fish abound in gelatine and isinglass, and in some of the cartilaginous fishes especially the greater portion of the muscles seem to consist chiefly of gelatine of various degrees of consistency. It may be said of fish generally that the nutritive preponderates over the heat-imparting qualities.

The following account of "a fish dinner experiment" was contributed several years ago to a popular magazine by the author of this book, and it is so much to the purpose, that he is induced to repeat the story for the benefit of his present readers : — "A lady being very desirous of testing the food power of fish with that of butcher meat, purchased a cod-fish, for which she paid 10s, the rate being 6d per lb. There were eight persons in the family circle of this lady, and she had resolved that the fish, with a few little odds and ends, should be 'the day's dinner.' She had the cod divided into three portions, the head and shoulders she boiled, the middle portion was baked, and the tail part was made into a curry, a little water in which a piece of veal had been boiled the previous day being added. Melted butter and half a hundred small 'sauce oysters' added to the cost of the banquet. The rest of the dinner consisted of a bread-pudding. But it is only with the fish as holding comparison with butcher meat that we take business. The cod-fish was bought whole, but came home cleaned, and was, of course, minus the liver, the sounds, and the tongue, which portions the fishmonger doubtless kept as perquisites for his trouble. The roe, however, was in the fish, and was fried. The cost of the fish, as has been stated, was 10s, and the half-pound of butter which was required for sauce, cost 9d, and the oysters cost 3s 6d, making a total of 14s 3d, to which may be added a few pence for lard and curry powder, say in all 15s. The dinner was quite a success, so far as the cooking was concerned, but the children, and the big people as well, became hungry sooner than usual, so that the serving of tea had to be expedited by about an hour. Papa did not "feel" satisfied, he had a feeling as if he had not dined; mamma said little, but she felt that the experiment, comparatively speaking, had been an expensive one, and that is the fact. The same sum of money expended on butcher meat would, doubtless, have produced a more satisfactory meal, and one which would have stayed the stomach for a longer period.

A very tolerable gigot of mutton may be obtained for less than half a sovereign, and a pair of rabbits for a curry, with a little bit of fat boiling beef to aid the mess, would not have cost more money than the cod-fish, and would have imparted to all who sat down to table the satisfactory feeling of having 'dined.'

Having consulted a number of the best authorities on the subject, I have been forced to the conclusion that men cannot live by fish alone, especially men inhabiting cold or temperate countries. Fish, no doubt, forms an excellent portion of the national commissariat; but when all that can be said on its behalf is admitted, it can only be accepted as a variety in the nation's food. A well-known writer on the economy of the human body contends that an occasional fish dinner is the best corrective for our almost daily indulgence in the pleasures of the table. But by a fish dinner it is not meant that we should go to an expensive tavern and pay two guineas for a dish of whitebait and a puree of eels. The proper fish dinner is a broiled mackerel, fresh from the sea, served with a nice sauce, and a little bit of some farinaceous pudding; such Lenten entertainment is, we are assured, good.

Apropos to Lent, let me, before closing this chapter, bring to focus a few of the more notable facts and traditions connected with food days and the eating of fish. Lent, in fact, might now be relegated into the domain of political economy, and in these present days of abject *gourmanderie*, it would be well if some great medical authority were to proclaim that an occasional day of fasting is really good for the body, and that a change from flesh to fish comes as a tonic to the stomach. In looking back upon some of the old statutes, it almost appears as if the eating of fish was recommended, or rather decreed, because of the scarcity of flesh meats. Another idea which developed itself at an early period was that fish ought to be extensively eaten because the capture of these animals gave employment to the fisherman, from whose ranks government would be able to recruit the Naval Forces of the Kingdom. In all great houses in this country, from the Palace of Royalty to the Hall of the Squire, an example of eating fish on certain days of the week was at one time set to the people; just as in a former time the pious monarchs of France publicly dined on fish fare in order to recommend, by their example, the use of fish as food. It is recorded that the fish Cookery of France, hundreds of years ago, was, "most appetizing;" one of our English kings, during a visit

to that country, became so fond of their lamprey pies, that he ordered their introduction at his own table, and by too liberally partaking of them he died of indigestion. At one time lampreys formed a favourite dish of the nobility and gentry of England and were eaten in large quantities, cooked in many forms. The herring, also, about the time indicated, that is, a few centuries ago, was likewise a favourite fast-day fish ; it was eaten at nearly every meal, being cooked in pies and roasted in bundles, fastened with skewers before a brisk fire. Eels were in constant use ; in various notes of the household expenses of Bishop Swinfield, we are told of the uses of eels as fast-day food ; they were bought by the "stick" of a quarter of a hundred, which cost four shillings.

The variety of fish provided on fast-days was as considerable as it is now ; in the household of a Bishop of Hereford, the dietary for Wednesday, Friday, and Saturday is laid down as consisting of herrings, eels, lampreys, salmon, wine, and beer, as also hake and conger. On the days of flesh meat large quantities of pork, mutton, and beef, were "devoured ;" it seems a strong word, but it is the right one. An old author, commenting on the food of the period, says, that "the retainers of a great nobleman knew no measure of their stomachs on Sundays when they were set down to beef and fat capons."

In London, in the olden times, the market prices of fish were pre-arranged by the authority of Edward the First, laid down very stringent regulations for the prevention of high prices, and the profits of all fishmongers were decreed at not more than a penny in the shilling. The following were fixed at one time as the market prices :—mackerel 1d. and turbot 6d. each ; soles, twelve for 3d ; pickled herrings, 1d. per score ; oysters, 2d. per gallon, eels 4d. per hundred. No fish were allowed to be sold that were more than one day out of the water. In the reign of Edward Second, the fishmongers, who, by that time had a flourishing guild, were jealous of their trade being intruded upon by interlopers, or of any persons selling fish in the city, unless they became members of the Fishmongers' Company. It was a rule that in selling fish for fast-day uses, purveyors of the Court were to be supplied before any of His Majesty's subjects. At one period previous to 1483, there were two bodies of fishmongers recognized, each with different interests, one was composed of those selling wet, and the other of those who dealt in dry fish. By the granting of a new charter in the year just

named, the two bodies were united as one of the livery companies of London, in the year 1506 however, the company became divided into two sections, the dealers in dried fish esteeming themselves of much greater importance than their brethren who dealt in the fresh or wet commodity. A large amount of capital was needed to carry on business, as stock fish merchants required to give long credit to not a few of their customers. Most of the great English families were wont, at the close of autumn, to give orders for their winter supply of fish; dried ling, cured herring, or other sorts which were packed away in lofts in alternate layers of pease straw, so that the stock might keep all the winter over.

Tusser thus alludes to the way of storing the fish :—

“ Choose skillfully salt-fish not burnt at the stone,
But such as be food or else let it alone,
Get home that is bought, and go stock it up dry
With pease straw between it the safer to lie.”

It was found to be a difficult task to keep the people of London faithful to fish diet on fish days, and it proved still more difficult to persuade them to dine on fish on other days of the week, although every possible argument was used to enforce the sumptuary laws of the time. In 1548 a statute was passed ordaining “ abstinence from flesh,” and imposing penalties on all who ate flesh on fast-days, when it was decreed that only fish should be eaten. These penalties were much increased by another act passed in 1562 for the maintenance of the navy, and in a pamphlet issued by John Erswicke in 1593, “ the benefits that grow to this realm by the observance of fish days ” were set forth. The author states that the non-observance of the fast-day regulations has injured the fish trade very much, and also, that Her Majesty’s Navy is suffering greatly from the want of a growing body of fishermen to supply sailors.

It is likewise complained of in the same pamphlet, that the farmers are grumbling because their market arrangements in respect to the sale of poultry are overturned by the excessive demands of the people for beef and mutton. At one time fines were imposed on persons who defied the laws in time of Lent, and ate flesh when they should have eaten fish, such amercements being fixed according to the rank of transgressors. In Scotland, an Act was passed in 1594, extending the period of Lent, and decreeing that no flesh meats should be eaten on the Wednesdays, Fridays, and Saturdays. A commentator on the

Scottish history of this period, remarks that the Act in question evidently embodied a political move in favour of the Scottish fisheries, although it was in a way, done in favour of the Church.

The following tabular view of the dates when our principal fishes are in season does not refer to any particular locality, but has been compiled to show that fish are to be obtained nearly all the year round from some part of the coast :—

FISH TABLE.

S denotes that the fish is in season ; F in finest season ; and O out of season.

| | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-------------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|
| Brill, . . | S | S | S | S | S | S | S | S | S | S | S | S |
| Cockles, . | S | S | S | S | O | O | O | O | S | S | S | S |
| Cod, . . | F | S | S | O | O | O | O | O | S | S | F | F |
| Crabs, . . | O | O | O | S | F | F | F | F | F | S | S | S |
| Dabs, . . | S | S | S | S | S | S | S | S | O | O | O | O |
| Eels, . . | S | S | S | O | O | O | O | S | F | F | F | S |
| Flounders, | S | S | S | S | S | S | S | S | S | S | S | S |
| Gurnets, . | O | O | O | O | S | S | S | S | S | O | O | O |
| Haddocks, | F | S | O | O | S | S | S | S | S | F | F | F |
| Halibut, . | S | F | F | S | S | F | F | S | S | S | S | S |
| Herrings, | S | S | O | O | S | S | F | F | S | S | S | S |
| Ling, . . | S | S | F | S | O | O | O | O | O | S | S | S |
| Lobsters, | O | O | O | S | F | F | F | S | S | S | S | S |
| Mackerel, | O | O | O | S | S | S | S | S | S | S | O | O |
| Mullet, . | O | O | O | S | S | S | S | O | O | O | O | O |
| Mussels, | S | S | S | S | O | O | O | O | S | S | S | S |
| Oysters, . | S | S | F | F | O | O | O | O | S | S | S | S |
| Plaice, . . | S | O | O | O | S | S | S | S | S | S | S | S |
| Salmon, . | O | S | S | F | F | F | S | S | O | O | O | O |
| Shrimps, | S | S | S | S | S | S | S | S | S | S | S | S |
| Skate, . . | F | F | F | F | F | F | S | S | O | O | S | S |
| Smelts, . . | S | S | S | S | S | O | O | O | O | O | S | S |
| Soles, . . | S | S | S | S | S | S | S | S | S | S | S | S |
| Sprats, . . | S | O | O | O | O | O | O | O | O | O | S | S |
| Thornback, | O | O | O | O | O | O | S | S | S | S | S | O |
| Trout, . . | O | S | F | F | F | F | S | S | O | O | O | O |
| Turbot, . | S | S | S | S | S | S | S | S | S | S | S | S |
| Whittings, | F | F | O | O | O | S | S | S | S | F | F | F |

THE FISHER-FOLK.

The Fisher-People the same everywhere—Growth of a Fishing Village—Marrying and giving in Marriage—Newhaven, near Edinburgh—Newhaven Fishwives—A Fishwife's mode of doing Business—Superstitions—Dunbar—Buckhaven—Scene of the *Antiquary*: Auchmithie—Smoking Haddocks—The Round of Fisher Life—Fittie and its quaint Inhabitants.

A BOOK describing the harvest of the sea must of necessity contain a chapter about the quaint people who gather in that harvest, otherwise it would be like playing "Hamlet" without the hero. I have a considerable acquaintance with the fisher-folk; and while engaged in collecting information about the fisheries, and in investigating the natural history of the herring and other food-fishes, have visited most of the Scottish fishing villages and many of the English ones, nor have I neglected Normandy, Brittany, and Picardy; and wherever I went I found the fisher-folk to be the same, no matter whether they talked a French *patois* or a Scottish dialect, such as one may hear at Buckie on the Moray Firth, or in the *Rue de Pollet* of Dieppe. The manners, customs, modes of life, and even the dress and superstitions, are nearly the same on the coast of France as they are on the coast of Fife, and used-up gentlemen in search of seaside sensations could scarcely do better than take a tour among the Scottish fisher-folks, in order to view the wonders of the fishing season, its curious industry, and the quaint people. There are scenes on the coast worthy of any sketch-book; there are also curious seaside resorts that have not yet been vulgarised by hordes of summer visitors—infant fishing villages, set down by accident in the most romantic spots, occupied by hardy men and rosy women, who have children "paidling" in the water or building castles upon the sand. Such seascapes—for they look more like pictures than realities—may be witnessed from the deck of the steamboat on the way to Inverness or Ultima Thule.

Looking from the steamer—if one cannot see the coast in any other way—at one of these embryo communities, one may readily guess, from the fond attitude of the youthful pair who are leaning on the old boat, that another cottage will speedily require

to be added to the two now existing. In a few years there will be another ; in course of time the four may be eight, the eight sixteen ; and lo ! in a generation there is built a large village, with its adult population gaining wealth by mining in the silvery quarries of the sea ; and by and by we will see with a pleased eye groups of youngsters splashing in the water or gathering seaware on the shore, and old men pottering about the rocks setting lobster-pots, doing business in the crustaceous delicacies of the season. And on glorious afternoons, when the atmosphere is pure, and the briny perfume delicious to inhale—when the water glances merrily in the sunlight, and the sails of the dancing boats are just filled by a capful of wind—the people will be out to view the scene and note the growing industry of the place ; and, as the old song says—

“ O weel may the boatie row.
And better may she speed ;
And muckle luck attend the boat
That wins the bairnies’ bread.”

In good time the little community will have its annals of births, marriages, and deaths ; its chronicles of storms, its records of disasters, and its glimpses of prosperity ; and in two hundred years its origin may be lost and the inhabitants of the original village represented by descendants in the sixth generation. At any rate, boats will increase, curers of herrings and merchants who buy fish will visit the village and circulate their money, and so the place will thrive. If a pier should be built, and a railway branch out to it, who knows but it may become a great port ?

I first became acquainted with the fisher-folk by assisting at a fisherman’s marriage. Marrying and giving in marriage involves an occasional festival among the fisher-folks of Newhaven of drinking and dancing—and all the fisher-folks are fond of the dance. In the more populous fishing towns there are usually a dozen or two of marriages to celebrate at the close of each herring season ; and as these weddings are what are called in Scotland penny weddings—*i.e.* weddings at which each guest pays a small sum for his entertainment, there is no difficulty in obtaining admission to the ceremony and customary rejoicings. Young men often wait till the close of the annual fishing before they venture into the matrimonial noose ; and I have seen at Newhaven as many as eight marriages in one evening. It has been said that a “ lucky ” day, or rather night, is usually chosen

for the ceremony, for "luck" is the ruling deity of the fishermen; but as regards the marriage customs of the fisher-class, it was explained to me that marriages were always held on a Friday (usually thought to be an unlucky day), from no superstitious feeling or notion, as was sometimes considered by strangers, but simply that the fishermen might have the last day of the week (Saturday) and the Sunday to enjoy themselves with their friends and acquaintances, instead of, if their weddings took place on Monday or Tuesday, breaking up the whole week afterwards. I considered this a sort of feasible and reasonable explanation of the matter. On such occasions as those of marriage there is great bustle and animation. The guests are invited two days beforehand by the happy couple *in propriis personis*, and means are taken to remind their friends again of the ceremony on the joyous day. At the proper time the parties meet—the lad in his best blue suit, and the lass and all the other maidens dressed in white—and walk to the manse or church, as the case may be, or the minister is "trysted" to come to the bride's father's residence. There is a great dinner provided for the happy occasion, usually served at a small inn or public-house when there is a very large party. All the best viands which can be thought of are procured: fish, flesh, and fowl, porter, ale, and whisky, are all to be had at these banquets, not forgetting the universal dish of skate, which is produced at all fisher marriages. After dinner, comes "the collection," when the best man, or some one of the company, goes round and gets a shilling or a sixpence from each. This is the mode of celebrating a penny wedding, and all are welcome who like to attend, the bidding being general. The evening winds up, so far as the young folks are concerned, with unlimited dancing. In fact, dancing at one time used to be the favourite recreation of the fisher-folk. In a dull season they would dance for "luck," in a plentiful season for joy—anything served as an excuse for a dance. On the wedding-night the old folks sit and enjoy themselves with a bowl of punch and a smoke, talking of old times and old fishing adventures, storms, miraculous hauls, etc.; in short, like old military or naval veterans, they evince a strong *penchant* to "fight their battles o'er again." The fun grows fast and furious with all concerned, till the tired body gives warning that it is time to desist, and by and by all retire, and life in the fishing village speedily resumes its old jog-trot.

It would take up too much space, and weary the reader besides, were I to give in detail an account of the many fishing places I

have visited. My purpose will be amply served by glancing at a few Scottish fishing villages, which, with the information I can interpolate about the fisher-folks of the coast of France and the eel-breeders of Comacchio, not to mention those of Northumberland and Yorkshire, will be quite sufficient to give the general reader a tolerable idea of this interesting class of people ; and to suit my own convenience I begin at the place where I witnessed the marriage.

Newhaven is celebrated for its "fishwives," who were declared by King George IV. to be the handsomest women he had ever seen, and were looked upon by Queen Victoria with eyes of wonder and admiration. The Newhaven fishwife must not be confounded, by those who are unacquainted with her, with the squalid fish-hawkers of Dublin ; nor, although they can use strong language occasionally, are they to be taken as examples of the *genus* peculiar to Billingsgate. The Newhaven women are more like the buxom *dames* of the market of Paris, though their glory of late years has been somewhat dulled. There is this, however, to be said of them, that they are as much of the past as the present ; in dress and manners, they are the same now as they were a hundred years ago ; they take a pride in conserving all their traditions and characteristics, so that their customs appear unchangeable, and are never, at any rate, influenced by the alterations which art, science, and literature produce on the country at large.

Before the railway era, the Newhaven fishwife was a great fact, and could be met in Edinburgh in her picturesque costume of short but voluminous and gaudy petticoats, shouting "Caller herrings!" or "Wha'll buy my caller cod?" with all the energy that a strong pair of lungs could supply. Then, in the evening, there entered the city the oyster-wench, with her prolonged musical aria of "Wha'll o' caller ou?" But the spread of fishmongers' shops and the increase of oyster-taverns is doing away with this picturesque branch of the business. Forty years ago nearly the whole of the fishermen of the Firth of Forth, in view of the Edinburgh market, made for Newhaven with their cargoes of white fish ; and these, at that time, were all bought up by the women, who carried them on their backs to Edinburgh in creels, and then hawked them through the city. The sight of a bevy of fishwives in the streets of the Modern Athens, although comparatively rare, may still occasionally be enjoyed ; but the railways have lightened their labours, and we do not find them to-day climbing the *Whale Brae* with a hundredweight, or two hundred-

weight, perhaps, of fish, to be sold in driblets, for a few pence, in Edinburgh.

The industry of fishwives is proverbial, their chief maxim being, that "the woman that canna work for a man is no worth ane;" and accordingly they undertake the task of disposing of the merchandise, and acting as Chancellor of the Exchequer. Their husbands have "only" to catch the fish, their labour being finished as soon as the boats touch the quay. The Newhaven fishwife's mode of doing business is well known. She is always supposed to ask double or triple what she will take; and, on occasions of bargaining she is sure, in allusion to the hazardous nature of the gudeman's occupation, to tell her customers that "fish are no fish the day, they're just men's lives." The style of higgling adopted when dealing with the fisher-folk, if attempted in other kinds of commerce, gives rise to the well-known Scottish reproach of "D'ye tak' me for a fishwife?" The style of bargain-making carried on by the fishwives may be illustrated by the following little scene:—

A servant girl having just beckoned to one of them, is answered by the usual interrogatory, "What's yer wull the day, my bonnie lass?" and the "mistress" being introduced, the following conversation takes place:—

"Come awa, mem, an' see what bonnie fish I hae the day."

"Have you any haddocks?"

"Ay hae I, mem, an' as bonnie fish as ever ye clappit yer twa een on."

"What's the price of these four small ones?"

"What's yer wull, mem?"

"I wish these small ones."

"What d'ye say, mem? sma' haddies! they's no sma' fish, an they're the bonniest I hae in a' ma creel."

"Well, never mind, what do you ask for them?"

"Weel, mem, it has been awfu' wather o' late, an' the men canna get fish; ye'll no grudge me twentypence for thae four?"

"Twentypence!"

"Ay, mem; what for no?"

"They are too dear; I'll give—"

"What d'ye say, mem! ower dear! I wish ye kent it: but what'll ye gie me for thae four?"

"I'll give you a sixpence."

"Ye'll gie me a what?"

"A sixpence."

"I daur say ye wull, ma bonnie leddy, but ye'll no get thae four fish for twa six pences this day."

"I'll no give more."

"Well, mem, gude day" (making preparations to go); "I'll take eighteenpence and be dune wi't."

"No ; I'll give you twopence each for them."

And so the chaffering goes on, till ultimately the fishwife will take tenpence for the lot, and this plan of asking double what will be taken, which is common with them all and sometimes succeeds with simple housewives, will be repeated from door to door, till the supply be exhausted. The mode of doing business with a fishwife is admirably illustrated in the *Antiquary*. When Monkbarns bargains for "the bannockfluke" (turbot) and "the cock-padle" (the lump-sucker), Maggie Mucklebackit asks four shillings and sixpence, and ends, after a little negotiation and much finesse, in accepting half-a-crown and a dram; the latter commodity being worth siller just then, in consequence of the stoppage of the distilleries.

The fishwives while selling their fish will often say something quaint to the customer with whom they are dealing. I will give one instance of this, which, though somewhat ludicrous, is characteristic, and have no doubt the words were spoken from the poor woman's heart. "A fishwife who was crying her 'caller cod' in George Street, Edinburgh, was stopped by a cook at the head of one of the area stairs. A cod was wanted that day for the dinner of the family, but the cook and the fishwife could not trade, disagreeing about the price. The night had been stormy, and instead of the fishwife flying into a passion, as is their general custom when bargaining for their fish if opposed in getting their price, the poor woman shed tears, and said to the cook, 'Tak' it or want it ; ye may think it dear, but it's a' that's left to me for a faither o' four bairns.'"

Notwithstanding, however, their lying and cheating in the streets during the week when selling their fish, there are no human beings in Scotland more regular in their attendance at church. To go to their church on a Sunday, and see the women all sitting with their smooth glossy hair and snow-white caps, staring with open eyes and mouth at the minister, as he exhorts them from the pulpit as to what they should do, one would think them the most innocent and simple creatures in existence. But offer one of them a penny less than she feels inclined to take for a haddock, and he is a lucky fellow who escapes without its tail

coming across his whiskers. Of late our fishwives have been considering themselves of some importance. When the Queen came first to Edinburgh, she happened to take notice of them, and every printshop window was then stuck full of pictures of Newhaven fishwives in their quaint costume of short petticoats of flaming red and yellow colours. They wear a dress of a peculiar and appropriate fashion, consisting of a long blue duffle jacket, with wide sleeves, a blue petticoat usually tucked up so as to form a pocket, and in order to show off their ample under petticoats of bright-coloured woollen stripe, reaching to the calf of the leg. It may be remarked that the upper petticoats are of a striped sort of stuff technically called, we believe, drugget, and are always of different colours. As the women carry their load of fish on their backs in creels, supported by a broad leather belt resting forwards on the forehead, a thick napkin is their usual headdress, although often a muslin cap, or mutch, with a very broad frill, edged with lace, and turned back on the head, is seen peeping from under the napkin. A variety of kerchiefs or small shawls similar to that on the head encircle the neck and bosom, which, with thick worsted stockings and a pair of stout shoes, complete the costume.

The sketch of fisher-life in the *Antiquary* applies as well to the fisher-folk of to-day as to those of sixty years since. This is demonstrable at Newhaven; which though fortunate in having a pier as a rendezvous for its boats, thus admitting of a vast saving of time and labour, is yet behind many inland villages in point of sanitary arrangements. There is in the "town" an everlasting scent of new tar. and a permanent smell of decaying fish, for the dainty visitors who go down to the village from Edinburgh to partake of the fish-dinners for which it is so celebrated. Up the narrow closes, redolent of "bark," we see hanging on the outside stairs the paraphernalia of the fisherman—his "properties," as an actor would call them; nets, bladders, lines, and oilskin unmentionables, with dozens of pairs of those particularly blue stockings that seem to be the universal wear of both mothers and maidens. On the stair itself sit, if it be seasonable weather, the wife and daughters, repairing the nets and baiting the lines—gossiping of course with opposite neighbours, who are engaged in a precisely similar pursuit; and to-day, as half a century ago, the fishermen sit beside their hauled-up boats, in their white canvas trousers and their Guernsey shirts, smoking their short pipes, while their wives and daughters

are so employed, seeming to have no idea of anything in the shape of labour being a duty of theirs when ashore. In the flowing gutter, which trickles down the centre of the old village, we have the young idea developing itself in plenty of noise, and adding another layer to the incrustation of dirt which it seems to be the sole business of these children to collect on their bodies. These juvenile fisher-folk have already learned from the mud-larks of the Thames the practice of sporting on the sands before the hotel windows, in the expectation of being rewarded with a few half-pence. "What's the use of asking for siller before they've gotten their denner?" we once heard one of these precocious youths say to another, who was proposing to solicit bawbees from a party of strangers.

To see the people of Newhaven, both men and women, one would be apt to think that their social condition was one of great hardship and discomfort: but one has only to enter their dwellings in order to be disabused of this notion, and to be convinced of the reverse of this, for there are few houses among the working population of Scotland which can compare with the well-decked and well-plenished dwellings of these fishermen. Within doors all is neat and tidy. When at the marriage I have mentioned, I thought the house I was invited to was the cleanest and the cosiest-looking house I had ever seen. Never did I see before so many plates and bowls in any private dwelling; and on all of them, cups and saucers not excepted, fish with their fins spread wide out, were painted in glowing colours; and in their dwellings and domestic arrangements the Newhaven fishwives are the cleanest women in Scotland, and the comfort of their husbands when they return from their labours on the wild and dangerous deep seems to be the fishwife's chief delight. I may also mention that none of the young women of Newhaven will take a husband out of their own community, that they are as rigid in this matrimonial observance as if they were all Jewesses.*

* There fishermen and fishermen's daughters marry and are given in marriage to each other with a sacredness only second to the strictness of intermarriage observed among the Jews. On making inquiry we find that occasionally one of these buxom young damsels chooses a husband for herself elsewhere than from among her own community; but we understand that when this occurs the bride loses caste, and has to follow the future fortunes of the bridegroom, whatever these may turn out to be. Speaking of marriages, the present great scarcity both of beef and mutton, and the consequent

The remains of many old superstitions are still to be found about Newhaven. I could easily fill a page or two of this volume with illustrative anecdotes of sayings and doings that are abhorrent to the fisher mind. The following are given as the merest sample of the number that might be collected. They have several times "gone the round" of the newspapers, but are none the worse of that :—

If an uninitiated greenhorn of a landsman chanced to be on board of a Newhaven boat, and, in the ignorance and simplicity of his heart, talked about "salmon," the whole crew—at least a few years ago—would start, grasp the nearest *iron thowell*, and exclaim, "Cauld iron! cauld iron!" in order to avert the calamity which such a rash use of the appellation was calculated to induce; and the said uninitiated gentleman would very likely have been addressed in some such courteous terms as "O ye igrant brute, cud ye no a' ca'd it redfish?" Woe to the unfortunate wight—be he Episcopalian or Presbyterian, Churchman or Dissenter—who being afloat talks about "the minister:" there is a kind of undefined terror visible on every countenance if haply this unlucky word is spoken; and I would advise my readers, should they hereafter have occasion, when water-borne, to speak of a clergyman, to call him "the man in the black

high price of these articles of food, seems in no way to terrify the denizens of Newhaven, for there the matrimonial knot is being briskly tied. While chatting with some of the fishermen just the other day we heard that two of these celebrations had taken place the night before, and that other four weddings were expected to come off during this week; and we both heard and saw the fag end of the musical and dancing jollification, which was held in a public house on these two recent occasions, and which was kept up till far on in the next afternoon. We can see little to tempt the young women of Newhaven to enter into the marriage state, for it seems only to increase their bodily labour. This circumstance, however, would appear to be no obstacle in the way; but rather to spur them on; and we recollect of once actually hearing, when a girl rather delicate for a Newhaven young woman was about to be married, another girl, a strapping lass of about eighteen, thus express herself :—'Jenny Flucker takin' a man! she's a guid cheek; hoo is she tae keep him? the puir man'll hae tae sell his fish as weel as catch them.' When upon this subject of intermarriages among the Newhaven people it is proper to mention that we heard contradictory accounts regarding the point; some saying that no such custom existed, or at least that no such rule was enforced by the community, while another account was that only one marriage out of the community had, so far as had come to the knowledge of our informant, taken place during the last eight or nine years."—*North Briton*, 1870.

coat;" the thing will be equally well understood, and can give offence to none. I warn them, moreover, to be guarded and circumspect should the idea of a cat or a pig flit across their minds; and should necessity demand the utterance of their names, let the one be called "Theebet" and the other "Sandy;" so shall they be landed on *terra firma* in safety, and neither their ears nor their feelings be insulted by piscatory *wit*. In the same category must be placed every four-footed beast, from the elephant moving amongst the jungles of Hindostan to the mouse that burrows under the cottage hearth-stone. Some quadrupeds, however, are more "unlucky" than others; dogs are detestable, hogs horrible, and hares hideous! It would appear that Friday, for certain operations, is the most unfortunate; for others the most auspicious day in the week. On that day no sane fisherman would commence a Greenland voyage, or proceed to the herring-ground, and on no other day of the week would he be married.

In illustration of the peculiar dread and antipathy of fishermen to swine, I give the following extract from a volume published by a schoolmaster, entitled *An Historical Account of St. Monance*. The town is divided into two divisions, the one called Nethertown and the other Overtown—the former being inhabited entirely by fishermen, and the latter by agriculturalists and petty tradesmen:—"The inhabitants of the Nethertown entertained a most deadly hatred towards swine, as ominous of evil, insomuch that not one was kept amongst them; and if their eyes haplessly lighted upon one in any quarter, they abandoned their mission and fled from it as they would from a lion, and their occupation was suspended till the ebbing and flowing of the tide had effectually removed the spell. The same devils were kept, however, in the Upperton, frequently affording much annoyance to their neighbours below, on account of their casual intrusions, producing much damage by suspension of labour. At last, becoming quite exasperated, the decision of their oracle was to go in a body and destroy not the animals (for they dared not hurt them), but all who bred and fostered such demons, looking on them with a jealous eye, on account of their traffic. Armed with boat-hooks, they ascended the hill in formidable procession, and dreadful had been the consequence had they not been discovered. But the Upperton, profiting by previous remonstrance, immediately let loose their swine, whose grunt and squeak chilled the most heroic blood of the enemy, who, on beholding them, turned and fled down the hill with tenfold speed, more exasperated than ever, secreting

themselves till the flux and reflux of the tide had undone the enchantment. . . . According to the most authentic tradition, not an animal of the kind existed in the whole territories of St. Monance for nearly a century ; and, even at the present day, though they are fed and eaten, the fisher people are extremely averse to looking on them or speaking of them by that name ; but, when necessitated to mention the animal, it is called 'the beast,' or 'the brute,' and, in case the real name of the animal should accidentally be mentioned, the spell is undone by a less tedious process—the exclamation of 'cauld iron' by the person affected being perfectly sufficient to counteract the evil influence. Cauld iron, touched or expressed, is understood to be the first antidote against enchantment."

The system of merchandise followed by the fishwives in the old days of creel-hawking, and even yet to a considerable extent, was very simple. Having procured a supply of fish, which having bestowed in a basket of a form fitted to the back, they used to trudge off to market under a load which most men would have had difficulty in carrying, and which would have made even the strongest stagger. Many of them still proceed to the market, and display their commodities ; but the majority, perhaps, perambulate the streets of the city, emitting cries which, to some persons, are more loud than agreeable, and which a stranger would never imagine to have the most distant connection with fish. Occasionally, too, they may be seen pulling the door-bell of some house where they are in the habit of disposing of their merchandise, with the blunt inquiry, "Ony haddies the day?"

While treating of the peculiarities of these people I may record the following characteristic anecdote :—"A clergyman, in whose parish a pretty large fishing-village is situated, in his visitations among the families of the fish-carriers found that the majority of them had never partaken of the sacrament. Interrogating them regarding the reason of this neglect, they candidly admitted to him that their trade necessarily led them so much to cheat and tell lies, that they felt themselves unqualified to join in that religious duty." It is but justice, however, to add that, when confidence is reposed in them, nothing can be more fair and upright than the dealings of the fisher class ; and, as dealers in a commodity of very fluctuating value, they cannot perhaps be justly blamed for endeavouring to sell it to the best advantage.

At Prestonpans, and the neighbouring village of Cockenzie,

the modern system, as I may call it, for Scotland, of selling the fish wholesale, may be seen in daily operation. When the boats arrive at the boat-shore, the wives of those engaged in the fishing are in readiness to obtain the fish, and carry them from the boats to the place of sale. They are at once divided into lots, and put up to auction, the skipper's wife acting as the George Robins of the company, and the price obtained being divided among the crew, who are also, generally speaking, owners of the boat. Buyers, or their agents, from Edinburgh, Glasgow, Liverpool, Manchester, etc., are always ready to purchase, and in a few hours the scaly produce of the Firth of Forth is being whisked along the railway at the rate of twenty miles an hour. This system, which is certainly a great improvement on the old creel-hawking plan, is a faint imitation, of what is done in England, where the owners of fishing-smacks consign their produce to a wholesale agent at Billingsgate, who sells it by auction in lots to the retail dealers and costermongers.

Farther along on the Scottish east coast is North Berwick, now a bathing resort, and a fishing town as well; and farther east still is Dunbar, the seat of an important herring-fishery—grown from a fishing village into a country town, in which a mixture of agricultural and fishing interests gives the place a somewhat heterogeneous aspect; and between St. Abb's Head and Berwick-on-Tweed is situated Eyemouth, a fishing village pure and simple, with all that wonderful filth, scattered about, which is a sanitary peculiarity of such towns. The population of Eyemouth is in keeping with the outward appearance of the place. As a whole, they are a rough uncultivated people, and more drunken in their habits than the fishermen of the neighbouring villages. Coldingham Shore, for instance, is only three miles distant, and has a population of about one hundred fishermen, of a very respectable class, sober, well-dressed, and "well-to do." A year or two ago an outburst of what is called "revivalism" took place at Eyemouth, and seemed greatly to affect it. The change produced for a time was unmistakable. These rude unlettered fishermen ceased to visit the public-houses, refrained from the use of oaths, and instead sung psalms and said prayers. But this wave of revivalism, which passed over other villages besides Eyemouth, has rolled away back, and in some instances left the people worse than it found them.

Crossing the Firth of Forth, the coast of Fife, from Burnt-island to the "East Neuk," will be found studded at intervals

with quaint fishing-villages ; and the quaintest among the quaint is Buckhaven. Buckhaven, or, as it is locally named, Buckhyne, as seen from the sea, is a picturesque group of houses sown broadcast on a low cliff. Indeed, most fishing villages seem thrown together without any kind of plan. The local architects had never thought of building their villages in rows or streets ; as the fisher-folk themselves say, their houses are “a’ heids and thraws,” that is, set down here and there without regard to architectural arrangement. The origin of Buckhaven is rather obscure : it is supposed to have been founded by the crew of a Brabant vessel, wrecked on that portion of the Fife coast in the reign of Philip II. The population are, like most of their class, a peculiar people, living entirely among themselves ; and any stranger settling among them is viewed with such suspicion that years will often elapse before he is adopted as one of the community. One of the old Scottish chap-books is devoted to a satire of the Buckhaven people. These old chap-books are now rare, and to obtain them involves a considerable amount of trouble. Thirty years ago the chapmen were still carrying them about in their packs : now it is pleasing to think they have been superseded by the admirable cheap periodicals which are so numerous and so easy to purchase. The title of the chap-book referred to above is, *The History of Buckhaven in Fifeshire, containing the Witty and Entertaining Exploits of Wise Willie and Witty Eppie, the Ale-wife, with a description of their College, Coats of Arms, etc.* It would be a strong breach of etiquette to mention the title of this book to any of the Buckhaven people ; it is difficult to understand how they should feel so sore on the point, as the pamphlet in question is a collection of very vulgar witticisms tinged with such a dash of obscenity as prevents their being quoted here. The industrious fishermen of Buckhaven are moral, sober, and comparatively wealthy. As denoting the prosperous state of the people of Buckhaven, it may be stated that most of the families there have saved money ; and not a few of them have a bank account, as well as considerable capital in boats, nets, and lines. Fishermen, being much away from home, at the herring-fishery or out at the deep-sea fishing, have no temptation to spend their earnings or waste their time in the tavern. Indeed, in some Scottish fishing villages there is not a public-house. The Buckhaven men delight in their boats, which are mostly “Firth-built,”—i.e., built at Leith on the Firth of Forth. Each boat with its appurtenances has generally

more than one owner; in other words, it is held in shares. This is rather an advantage than otherwise, as every vessel requires a crew of four men at any rate, so that each boat is usually manned by two or three of its owners—a pledge that it will be looked carefully after and not be exposed to needless danger. With all the youngsters of a fishing village it is a point of ambition to obtain a share of a boat as soon as ever they can; so that they save hard from their allowances as extra hands, in order to attain as early as possible to the dignity of proprietorship. We look in vain, except at such wonderful places as Rochdale, to find manufacturing operatives in a similar financial position to to these Buckhaven men: in fact, our fishermen have been practising the plan of co-operation for years without knowing it, and without making it known. The co-operative system seems to prevail among the English fisher-folk as well. At Filey, on the Yorkshire coast, many of the large fishing yawls—these vessels average about 40 tons each—are built by little companies and worked on the sharing principles: so much to the men who find the bait, and so much to each man who provides a net; and a few shillings per pound of the weekly earnings of the ship go to the owners. In France there are various ways of engaging the boats and conducting the fisheries. There are some men who fish on their own account, who have their own boat, sail, and nets, etc., and who find their own bait, whether at the sardine-fishery or when prosecuting any other branch of the sea-fisheries. Of course these boat-owners hire what assistance they require, and pay for it. There are other men again who hire a boat, and work it on the sharing plan, each man getting so much, the remainder being left for the owner. A third class of persons are those who work off their advances: these are a class of men so poor as to be obliged to pawn their labour to the boat-owners long before it is required. We can parallel this at home in the herring-fishery, where the advance of money to the men has become something very like a curse to all concerned.

The retired Buckhaven fishermen can give interesting information about the money value of the fisheries. One, who was a young fellow five and thirty years ago, told me the herring-fishery was a kind of lottery, but that, on an average of years, each boat would take annually something like a hundred crans—the produce, in all cases where the crew were part owners, after deducting a fifth part or so to keep up the boat, being equally divided. “When I was a youngster, sir,” said this person, “there

was lots o' herrin', an' we had a fine winter fishin' as well, an' sprats in plenty. As to white fish, they were abundant five-an'-twenty years ago. Haddocks now are scarce to be had; being an inshore fish, they've been a' ta'en, in my opinion. Line-fishin' was very profitable from 1830 to 1840. I've seen as many as a hunder thoosand fish o' ae kind or anither ta'en by the Buckhynne boats in a week—that is countin' baith inshore boats an' them awa at the Dogger Bank. The lot brocht four hunder pound; but a' kinds of fish are now sae scarce that it taks mair than dooble the labour to make the same money that was made then."

I will now carry the reader with me to a very quaint place indeed, the scene of Sir Walter Scott's novel of *The Antiquary*—Auchmithie. The supposed scene of Sir Walter Scott's novel of *The Antiquary*, on the coast of Forfarshire, presents a conjunction of scenic and industrial features which commends it to notice. At Auchmithie, which is distant a few miles from Arbroath, there is often some cause for excitement; and a real storm or a real drowning is something vastly different from the shipwreck in the drama of *The Tempest*, or the death of the Colleen Bawn. The beetling cliffs barricading the sea from the land may be traversed by the tourist to the music of the everlasting waves, the dashing of which only makes the deep solitude more solemn; the sea-gull sweeps around with its shrill cry, whilst playful whales gambol in the placid waters.

The village of Auchmithie, which is wildly grand and romantic, stands on the top of the cliffs, and as the road to it is steep, a great amount of labour devolves on the fishermen in carrying down their lines and nets, and carrying up their produce, etc. One customary feature observed by strangers on entering Auchmithie is, that when met by female children they invariably stoop down, make a very low curtsey, and for this piece of polite condescension they expect that a few halfpence will be thrown to them. If you pass on without noticing them they will not ask for anything, but once throw them a few halfpence and a pocketful will be required to satisfy their importunities. There are two roads leading to Auchmithie from Arbroath, one along the sea-coast, the other through the country. The distance is about $3\frac{1}{2}$ miles in a north-east direction, and the country road is the best; and approaching the village in that direction it has a very fair aspect. Two rows of low-built slate-roofed houses, and a school and chapel, stand a few yards off by themselves. On the north side of the village, is a stately farm-house, surrounded by trees,

and on the south side a Coast-Guard station, clean, whitewashed, and with a flag-staff, giving the whole a regular and picturesque appearance. Entering the village of Auchmithie from the west, and walking through to the extreme east end, the imagination gets staggered to think how any class of men could have selected such a wild and rugged part of the coast for pursuing the fishing trade—a trade above all others that requires a safe harbour where boats can be launched and put to sea at a moment's warning if any signals of distress be given. The bight of Auchmithie is an indentation into rocky cliffs several hundred feet in perpendicular height. About the middle of the bight there is a steep ravine or gully with a small stream, and at the bottom of this ravine there is a small piece of level ground where a fish-curing house is erected, and where also the fishermen pull up their boats, that they may be safe from easterly gales. There are in all about seventeen boats' crews at Auchmithie. Winding roads with steps lead down the side of the steep brae to the beach. There are a few half-tide rocks in the bight that may help to break the fury of waves raised by easterly winds; but there is no harbour or pier for the boats to land at or receive shelter from, and this the fishermen complain of, as they have to pay £2 a year for the privilege of each boat. The beach is steep, and strewn with large pebbles, excellently adapted, they say, for drying fish upon.

The visitor, in addition to studying the quaint people, may explore one of the vast caves which only a few years ago were the nightly refuge of the smuggler. Brandy Cove and Gaylet Pot are worth inspection, and inspire a mingled feeling of terror and grandeur. The visitor may also take a look at the "Spindle"—a large detached piece of the cliffs, shaped something like a corn-stack, or a boy's top with the apex uttermost. When the tide is full this rock is surrounded with water, and appears like an island. Fisher-life may be witnessed here in all its unvarnished simplicity. Indeed nothing could well be more primitive than their habits and mode of life. I have seen the women of Auchmithie "kilt their coats" and rush into the water in order to aid in shoving off the boats, and on the return of the little fleet carry the men ashore on their brawny shoulders with the greatest ease and all the *nonchalance* imaginable, no matter who might be looking at them. Their peculiar way of smoking their haddocks may be taken as a very good example of their other modes of industry. Instead of splitting the fish after cleaning

them, as the regular curers do, they smoke them in their round shape. They use a barrel without top or bottom as a substitute for a curing house. The barrel being inserted a little distance in the ground, an old kail pot or kettle, filled with sawdust, is placed at the bottom, and the inside is then filled with as many fish as can conveniently be hung in it. The sawdust is then set fire to, and a piece of canvas thrown over the top of the barrel : by this means the females of Auchmithie smoke their haddocks in a round state, and very excellent they are when the fish are caught in season. The daily routine of fisher-life at Auchmithie is simple and unvarying ; year by year, and all the year round, it changes only from one branch of the fishery to another. The season, of course, brings about its joys and sorrows : sad deaths, which overshadow the village with gloom ; or marriages, when the people may venture to hold some simple *fete*, but only to send them back with renewed vigour to their occupations. Time, as it sweeps over them, only indicates a period when the deep-sea hand-lines must be laid aside for the herring-drift, or when the men must take a toilsome journey in search of bait for their lines. Their scene of labour is on the sea, ever on the sea ; and, trusting themselves on the mighty waters, they pursue their simple craft with persevering industry, never heeding that they are scorched by the suns of summer or benumbed by the frosts of winter. There is, of course, an appropriate season for the capture of each particular kind of fish. There are days when the men fish inshore for haddocks ; and there are times when, with their frail vessels, the fishermen sail long distances to procure larger fish in the deep seas, and when they must remain in their open boats for a few days and nights. But the El-dorado of all the coast tribe is "the herring." This abounding and delightful fish, which can be taken at one place or another from January to December, yields a six weeks' fishing in the autumn of the year, to which, as has already been stated, all the fisher-folk look forward with hope, as a period of money-making, and which, so far as the young people are concerned, is generally expected to end, like the third volume of a love-story, in matrimony.

Footdee, or "Fittie" as it is locally called, is a quaint suburb of Aberdeen, figuring not a little, and always with a kind of comic quaintness, in the traditions of that northern city, and in the stories which the inhabitants tell of each other. They tell there of one Aberdeen man, who, being in London for the first

time, and visiting St. Paul's, was surprised by his astonishment at its dimensions into an unusual burst of candour. "My stars!" he said, "this maks a perfect feel (fool) o' the kirk o' Fittie." Part of the quaint interest thus attached to this particular suburb by the Aberdonians themselves arises from its containing a little colony or nest of fisher-folk of immemorial antiquity. There are about a hundred families living in Fitte, or Footdee Square, close to the sea, where the Dee has its mouth. This community, like all others made up of fishing-folk, is a peculiar one, and differs of course from those of other working-people in its neighbourhood. In many things the Footdee people are like the gipsies. They rarely marry except with their own class; and those born in a community of fishers seldom leave it, and very seldom engage in any other avocation than that of their fathers. The squares of houses at Footdee are peculiarly constructed. There are neither doors nor windows in the outside walls, although these look to all the points of the compass; and none live within the square but the fishermen and their families, so that they are as completely isolated and secluded from public gaze as a regiment of soldiers within the dead walls of a barrack. The Reverend Mr. Spence, of Free St. Clement's, lately completed plans of the entire "toun," giving the number and the names of the tenants in every house; and from these exhaustive plans it appears that the total population of the two squares was 584—giving about nine inmates for each of these two-roomed houses. But the case is even worse than this average indicates. "In the South Square only eight of the houses are occupied by single families; and in the North Square only three, the others being occupied by at least two families each—one room apiece—and four *single* rooms in the North Square contain *two* families each! There are thirty-six married couples and nineteen widows in the twenty-eight houses; and the number of distinct families in them is fifty-four." The Fittie men seem poorer than the generality of their brethren. They purchase the crazy old boats of other fishermen, and with these, except on very fine weather, they dare not venture very far from "the seething harbour-bar;" and the moment they come home with a quantity of fish the men consider their labours over, the duty of turning the fish into cash devolving, as in all other fishing communities, on the women. The young girls or "queans," as they are called in Fittie, carry the fish to market, and the women sit there and sell them; and it is thought that it is the officious desire of their wives to be the

treasurers of their earnings, that keeps the fishermen from being more enterprising. The women enslave the men to their will, and keep them chained under petticoat government. Did the women remain at home in their domestic sphere, looking after the children and their husbands' comforts, the men would then pluck up spirit and exert themselves to make money in order to keep their families at home comfortable and respectable. Just now there are many fishermen who will not go to sea as long as they imagine their wives have got a penny left from the last hawking excursion. There is no necessity for the females labouring at out-door work. There are few trades in this country where industrious men have a better chance to make money than fishermen have, especially when they are equipped with proper machinery for their calling. At Arbroath, Auchmithie, and Footdee (Fittie), the fishing population are at the very bottom of the scale for enterprising habits and social progress. When the wind is in any way from the eastward, or in fact blowing hard from any direction, the fishermen at these places are very chary about going to sea unless dire necessity urges them.

The people of "Fittie" are progressing in morals and civilisation. One of the local journalists, who took the trouble to visit the place lately in order to describe truthfully what he saw, says :—"They have the reputation of being a very peculiar people, and so in many respects they are ; but they have also the reputation of being a dirtily-inclined and degraded people, and this we can certify from personal inspection they are not. We have visited both squares, and found the interior of the houses as clean, sweet and wholesome as could well be desired. Their whitewashed walls and ceiling, their well-rubbed furniture, clean bedding, and freshly-sanded floors, present a picture of tidiness such as is seldom to be met with among classes of the population reckoned higher in the social scale. And this external order is only the index of a still more important change in the habits and character of our fisher-toun, the population of which, all who know it agree in testifying, has within the past few years undergone a remarkable change for the better in a moral point of view. Especially is this noticed in the care of their children, whose education might, in some cases, bring a tinge of shame to the cheek of well-to-do town's folks. Go down to the fisher squares, and lay hold of some little fellow hardly able to waddle about without assistance in his thick made-down moleskins, and you will find he has the Shorter Catechism at his tongue-end. Ask

any employer in the neighbourhood of the shore where he gets his best apprentices, and he will tell you that for industry and integrity he finds no lads who surpass those from the fisher squares. Inquire about the families of the fishermen who have lost their lives while following their perilous occupation, and you will find that they have been divided among other families in the square, and treated by the heads of these families as affectionately as if they had been their own.

As regards the constant intermarrying of the fisher class, and the working habits of their women, I have read an Italian fable to the follow effect :—"A man of distinction, in rambling one day through a fishing-village, accosted one of the fishermen with the remark that he wondered greatly that men of his line of life should chiefly confine themselves, in their matrimonial connections, to women of their own caste, and not take them from other classes of society, where a greater security would be obtained for their wives keeping a house properly, and rearing a family more in accordance with the refinement and courtesies of life. To this the fisherman replied, that to him, and men of his laborious profession, such wives as they usually took were as indispensable to their vocation as their boat and nets. Their wives took their fish to market, obtained bait for their lines, mended their nets, and performed a thousand different and necessary things, which husbands could not do for themselves, and which women taken from any other of the labouring classes of society would be unable to do. 'The labour and drudgery of our wives,' continued he, 'is a necessary part of our peculiar craft, and cannot by any means be dispensed with, without retailing irreparable injury upon our social interests.' MORAL—This is one among many instances, where the solid and the useful must take precedence of the showy and the elegant."

STORIES OF FISHER-LIFE.

Signs and Tokens—French Fishwomen—The Fishwives of Paris—The Story of a Prestonpans Widow—Psalm John of Whelkholes—Jean Cowie's Story—Fisher Names—Dramatic Sketch—Growth of a Storm—The last Scene of all.

As has been already mentioned, the fishers are intensely superstitious. No matter where we view them, they are as much given to signs and omens at Portel near Boulogne as at Portessie near Banff. For instance, while standing or walking they don't like to be numbered. Rude boys will sometimes annoy them by shouting—

“ Ane, twa, three ;
What a lot o' fisher nannies I see ! ”

It is also considered very offensive to ask fisher-people, whilst on their way to their boats, where they are going to-day ; and they do not like to see, considering it unlucky, the impression of a very flat foot upon the sand ; neither, as I have already explained, can they go to work if on leaving their homes in the morning a pig should cross their path. This is considered a particularly unlucky omen, and at once drives them home. Before a storm, it is usually thought, there is some kind of warning vouchsafed to them ; they see, in their mind's eye doubtless, a comrade wafted homeward in a sheet of flame, or the wraith of some one beckons them with solemn gesture landward, as if saying, “Go not upon the waters.” At one time when an accident happened from an open boat, and any person was drowned, that boat was never again used, but was laid up high and dry, and allowed to rot away—rather a costly superstition. Then, again, some fisher-people perform a kind of “rite” before going to the herring-fishery, in drinking to a “white lug”—that is, that when they “pree” or examine a corner or lug of their nets, they may find it glitter with the silvery sheen of the fish, a sure sign of a heavy draught.

But the fishermen of other coasts are quite as quaint, superstitious, and peculiar, as those of our own. The residents in the *Faubourg de Pollet* of Dieppe are just as much alive to the

signs and tokens of the hour as the dwellers in the Square of Fittie, or those who inhabit the fishing quarter of Boulogne. It is a pity that the guide-books say so little about these and similar places. The fishing quarter of Boulogne is not unlike Newhaven: there is the same "ancient and fish-like smell," the same kind of women with very short petticoats, the only difference being that our Scottish fishwives wear comfortable shoes and stockings. We can see too the dripping nets hung up to dry from the windows of the tumble-down-like houses, and the *gamins* of Boulogne lounge about the gutters, squat on the large side stones, or run up and down the long series of steps, just the same as the fisher-folks' children do at home.

It is only, however, by penetrating into the quaint villages situated on the coasts of Normandy and Brittany, that we can gain a knowledge of the manners and customs of those persons who are daily engaged in prosecuting the fisheries. The clergymen of their districts, as may be supposed, have great power over them, and all along the French coast the fisher-people have churches of their own, and are constantly praying for "luck," or leaving propitiatory gifts upon the altars, as well as going pilgrimages in order that their wishes may be realised. A dream is thought of such great consequence among these people, that the women will hold a conference, early in the day, in order to its interpretation. Each little village has its storied traditions, many of them of great interest, and some of them very romantic. I can only briefly allude, however, to one of these little stories. Some of my readers may have heard of the Bay of the Departed on the coast of Brittany, where, in the dead hour of night, the boatmen are summoned by some unseen power to launch their boats and ferry over to a sacred island the souls of men who had been drowned in the surging waters. The fishermen tell that, on the occasion of those midnight freights, the boat is so crowded with invisible passengers as to sink quite low in the water, and the wails and cries of the shipwrecked are heard as the melancholy voyage progresses. On their arrival at the Island of Sein, invisible beings are said to number the invisible passengers, and the wondering awe-struck crew then return to await the next supernatural summons to boat over the ghosts to the storied isle, which was in long back days the chief haunt of the Druidesses in Brittany. A similar story may be heard at Guildo on the same coast. Small skiffs, phantom ones, it is currently believed, may be seen when the moon is bright, darting out from under

the castle cliffs, manned by phantom figures, ferrying over the treacherous sands the spirits whose bodies lie engulfed in the neighbourhood. Not one of the native population, so strong is the dread of the scene, will pass the spot after nightfall, and strange stories are told of phantom lights and woful demons that lure the unsuspecting wayfarer to a treacherous death.

The Parisian fishwives are clean and buxom women, like their sisters of Newhaven, and they are quite as celebrated if not so picturesque in their costume. About a century and a half ago—and I need not go farther back—there were a great number of fishwives in Paris, there being not less than 4000 oyster-women, who pursued their business with much dexterity, and were able to cheat their customers as well, if not better than any modern fishwife. One of their best tricks was to swallow many of the finest oysters under the pretence of their not being fresh. Among the Parisian fishwives of the last century we are able to pick out Madame Picard, who was famed for her poetical talent, and was personally known to many of the eminent Frenchmen of the last century. Her poems were collected and published in a little volume, and ultimately by marriage this fishwife became a lady, having married a very wealthy silk merchant. The fishwives of Paris have long been historical: they have figured prominently in all the great events connected with the history of that city. Deputations from these market-women, gorgeously dressed in silk and lace, and bedecked with diamonds and other precious stones, frequently took part in public affairs. Mirabeau was a great favourite of the Parisian fishwives; at his death they attended his funeral and wore mourning for him. These Poissardes took an active part in the revolution of 1789, and did deeds of horror and charity that one has a difficulty in reconciling. It was no uncommon sight, for instance, to see the fishwives carrying about on poles the heads of obnoxious persons who had been murdered by the mob.

The short and simple annals of the fisher-folk are all tinged with melancholy—there is a skeleton in every closet. There is no household but has to mourn the loss of a father or a son. Annals of storms and chronicles of deaths form the talk of the aged in all the fishing villages.

The following narrative is a sample of hundreds of other sad tales that might be collected from the coast people of Scotland. It was related to a friend by a woman at Musselburgh:—"Weel, ye see, sir, I haena ony great story to tell. At the time I lost

my guidman I was livin' doon by at the Pans (Prestonpans, a fishing village). The herrin' season was ower about a month, and my guidman had laid by a guid pickle siller, and we had skytched oot a lot o' plans for the futur'. We had nae bairns o' oor ain, although we had been married for mony years; but we had been lang thinkin' o' takin' in a wee orphint till bring up as oor ain; and noo that the siller was geyan' plenty, we settled that Marion M'Farlane should come hame till us by the beginnin' o' November. My guidman was thinkin' aboot buyin' a new boat, although his auld ane was no sae muckle the waur for wear. I was thinkin' aboot askin' the guidman for a new Sunday's goon: in fac', we were biggin' castles in the air a' on the foundation o' the herrin' siller; but hech, sir, its ower true that man—ay, and woman tae—purposes, but the Great Almichty disposes. The wee orphint wasna till find a new faither and mither in my guidman and me; the auld boat wasna till mak' room for a new ane; and my braw Sunday goon, which, gin I had had my choice, would hae been a bricht sky-blue ane, was changed intae black—black as night, black as sorrow and as death could mak' it. There was a fine fishin' o' the haddies, and the siller in the bank was growin' bigger ilka week, for the wather was at its best, and the fish plentiful'. Aweel, on the nicht o' the seventeenth o' November, after I had put a' the lines in order, and gien Archibald his supper, aff he gangs frae the herbour wi' his boat, and four as nice young chieles as ye ever set an ee on for a crew. An' there wasna muckle fear o' dirty wather, although the sun had gaen doon rayther redder than we could hae wished. Some o' the new married, and some o' the lasses that were sune to be married, used tae gang doon tae the herbour, and see their guidmen and their sweethearts awa'. I was lang by wi' that sort o' thing; no that my love was less, but my confidence was mair, seein' that it had been tried and faund true through the lang period o' fourteen years. As I was tidyin' up the hoose afore gangin' till my bed, I heard the men in the boats cryin' till ane anither, as they were workin' oot intae the firth. Tae bed I gaed, and lookin' at the lowe o' the fire as it keepit flichterin' up and deein' awa', sune set me soond asleep. What daftlike things folks think, see, and dae in their sleep. I dreamt that nicht that I was walkin' along the sands till meet my guidman, wha had landed his boat at Morrison's Haven. The sun was shinin' beautifu', and the waves were comin' tumlin' up the sand, sparklin' and lauchin' in the sunlicht, dancin' as if they never

did ony ill. I saw my guidman at the distance, and I put my best fit forrit till meet him. I was as near him as tae see his face distinctly, and was about tae cry oot, 'Archibald, what sort o' fishin' hae ye had?' when a' on a suddint a great muckle hand cam' doon frae the sky, and puttin' its finger and thoom roond my guidman, lifted him clean oot o' my sicht jist in a meenit. The fricht o' the dream waukened me, and I turned on my side and lookit at whaur the fire ought tae be, but it was a' blackness. The hoose was shakin' as if the great muckle hand had gruppit it by the gavel, and was shakin' it like a wunnelstraw. Hech, sir, ye leeve up in a toon o' lands, and dinna ken what a storm is. Aiblins ye get up in the mornin' and see a tree or twa lyin' across the road, and a lum tummilt ower the rufe, and a kittlin' or twa smoott aneath an auld barrel; but bless ye, sir, that's no a storm, sic as we folk on the seaside ken o'. Na, na! The sky—sky! there's nae sky, a' is as black as black can be; ye may put your hand oot and fill your nieve wi' the darkness, exceppin' the times when the lichtnin' flashes doon like a twisted threid o' purple gowd; and then ye can see the waves lookin' ower ane anither's heads, and gnashin' their teeth, as ye micht think, and cryin' oot in their anger for puir folk's lives. Siccan a night it was when I waukened. My guidman had been oot in mony a storm afore, sae I comforted mysel' wi' thinkin' that he would gey and likely mak for North Berwick or Dunbar when he saw the wather airtin for coorse. I wasna frichtened, yet I coudna sleep for the roarin' o' the wind. Mornin' cam'. I gaed doon till the shore, and a' the wives and sweethearts o' the Pans gaed wi' me. There was a heavy fog on the sea, sae thick that neither Inchkeith nor the Law were to be seen. Naething was there but the sea and the muckle waves lowpin' up and dashin' themselves tae death on the rocks and the sands. Eastwards and westwards we lookit, an' better lookit, but naething was till be seen but the fog and the angry roarin' sea—no a boat, no a sail was visible on a' the wild waters. Weel, we had a lang confab on the shore as tae what our guidmen and our sweethearts micht aiblins hae dune. It was settled amang us without a doot that they had gane intill North Berwick or Dunbar, and sae we expeckit that in the afternoon they would maybe tak' the road and come hame till comfort us. After denner we—that is, the wives and sweethearts—took the gait and went as far as Gosfort Sands till meet our guidmen and the lads. The rain was pourin' doon like mad; but what was that till us? we were lookin' for

what was a' the world till our bosoms, and through wind and weet we went tae find it, and we nayther felt the cauld blast nor the showers. Cauldly and greyly the short day fell upon the Berwick Law. Darker and darker grew the gloamin', but nae word o' them we' loo'd afore a' the world. The nicht closed in at lang and last, and no a soond o' the welcome voices. Eh, sir, aften and aften hae I said, and sang ower till mysel', the bonny words o' poetry that says—

‘ His very foot has music in’t,
As he comes up the stair.’

But Archibald's feet were never mair till come pap, pappin, in at the door. Twa sorrowfu' and lang lang days passed awa', and the big waves, as if mockin' our sorrow, flang the spars o' the boats up amang the rocks, and there was weepin' and wailin' when we saw them, or in the grand words o' The Book, there was 'lamentation and sorrow and woe.' We kent then that we nicht look across the sea, but ower the waters would never blink the een that made sunshine around our hearths; ower the waters would never come the voices that were mair delightfu' than the music o' the summer winds when the leaves gang dancing till their sang. My story, sir, is dune. I hae nae mair tae tell. Sufficient and suffice it till say, that there was great grief at the Pans—Rachel weepin' for her weans, and wouldna be comforted. The windows were darkened, and the air was heavy wi' sighin' and sabbin'."

The following sketches of life and character as seen in Scottish fishing communities may prove of interest to those who are unfamiliar with such scenes.

At Whelkholes the great specialty is "the herring." There are curers at the "Holes," and about seventy boats go out during the season to obtain that most abundant fish, which is captured in its season in the immediate vicinity. Great excitement always prevails during the herring season. It is looked forward to as a time of money-making, and much speculation as to whether the season will or will not be a "lucky" one prevails from an early period. Psalm John, the village oracle, has made the herring his peculiar study. He is the authority of Whelkholes on all things pertaining to fishing economy. He tells his brethren when it is time to start for the herring; he knows full well what signs indicate the appearance of that fish. When he sees the dolphin sporting in the bay or the birds skimming the water, then

he knows that herrings are there. For some days before the general launching of the boats for the herring harvest, Psalm John is wont to parade on the high cliff above the village, looking over the water for the expected and ever-welcome herring. Many a weary vigil has been held on that cliff. Many a weary foot has wandered over it during the fierce storms of the spring time, and many a beacon fire has been lighted there, as the women of the village sat at midnight looking across the turbulent sea, questioning with their anxious eyes each rolling billow that broke upon the shore, as to the fate of those afar off on the ravening deep. That cliff was the *via dolorosa* of Whelkholes. Many a painful tragedy had been witnessed from its pathway; and it led as well to that last resting-place of the villagers, the churchyard. It was from the pathway on the cliff, one hot autumn night, that Psalm John saw seven corpse-candles move from the village in a weird procession to the cemetery, and his prediction, that a wreck would occur, and that there would be seven corpses, was too surely fulfilled. John always saw a corpse-candle before a death, and all the people of the "Holes" believed in the superstition. The fisher folk, as a body, are great believers in apparitions and wraiths, and whenever a calamity of any kind occurs, there is always some man or woman who was sure it was to take place, as they had seen a funeral procession in the clouds, seven days before, or heard the eerie tick of the death-watch at midnight, or some other admonitory sign.

Psalm John was a man who never took spirits, and who attributed to them all the ills that came upon the people. After the great storm, he persuaded most of the male inhabitants to become temperance men. He then conducted a revival in the village, which was much talked of even in places at a great distance from Whelkholes. It was at the close of one very scanty herring harvest, that the village broke out into a great excitement. Psalm John had enunciated that the short fishing was a judgment put upon the people for their sins, and one day, while attending the funeral of an old friend, he felt impelled to kneel down among the mourners and pour out his soul in prayer. The scene was impressive. The gloaming was beginning to obscure the scene; the waves broke slow and murmuringly on the beach as the beautiful words of the Hundredth Psalm,

"All people that on earth do dwell,"

broke on the stillness that had hitherto reigned around. One of the women then stood out and addressed the little crowd in an earnest manner, enjoining them to leave off the evil tenor of their ways, and at once seek the path to heaven. From that night there was a striking change in the village ; after that it was no uncommon thing to hear a motley crowd of fishermen, coopers, and herring-gutters, singing a hymn in the curing-yard after they had finished the labours of the day. The revival was a great triumph to Psalm John, for next season the herrings were more abundant in the bay than they had ever before been known to be.

The reader is assured that this is a true sketch ; all that is fanciful in it is the name of the village. The revival movement was very general on the shores of the Moray Firth ; and although some very inexcusable extravagances were perpetrated, a residue of good has been left behind.

"Preaching Cowie" had been left fatherless at the early age of eight years, his father having been drowned in one of those awful storms of the north-east coast, and his boat, with all its dearly-bought fishing gear, lost ; but, in spite of all the disadvantages his son laboured under in consequence, he became at length a comparatively rich man, in the community of Shellbraes. Jean Cowie, his mother, Bull Cowie's widow, had since her bereavement grown a business of her own. She travelled for many years to all the neighbouring towns, both with fresh and cured fish, and only gave up doing so when her well-doing son had become a curer, and when she had herself, by means of her indomitable industry, become in the circumstances a wealthy woman. During the latter years of her life she was a rollicking self-possessed widow, with a great "gift of the gab." She bought fresh haddocks by the hundred from the fishers, and smoked them yellow in old barrels with smouldering pinewood, then packing up the fish in creels and other baskets, she carried them by rail or cart to market, where she chaffered and bargained, and sold and exchanged, and laughed and joked, or wept, according to her humour, with all whom she met. But those who scanned her countenance in the early years of her widowhood could easily observe the deep furrows that had been worn by the tears in her face. There was a perpetual sadness under Jean's forced gaiety, even when she was in the busy market-place ; and where, in the intervals of business, when she could gain a solitary place, she "smoked like mad" to stifle thought and

tranquillise her feelings. No one who encountered widow Cowie, as she sallied forth to the nearer towns, would have fancied that during one fatal morning her boy son, her husband, and her father, had all been borne into her house, in a melancholy procession, drowned! They had sailed away the day before to a distant fishing-bank, and while returning home were overtaken by a sudden storm, which dashed their boat upon the rocks within a few yards of the landing-place. There was great lamentation in the village over that calamity, for both Bull Cowie and his wife's father had been favourites in the Braes. Dancing Flucker, her father, had only a few days before he met his own death saved the life of a little child who had fallen into the sea. Thus Jean was suddenly left a widow with four young children; and when the first keenness of her grief had been somewhat deadened, she felt nerve to work as she had never worked before, for the sake of her young ones—*his* children. Jean scorned to ask assistance, or to go before "the Board." "Na, na," said the young widow; "neen o' my bairns 'ill ever hear it said that their mither geed on the parish. I can work—I can mak' nets or gather mussels, an' there's a kind Providence aboon us a', an' neen that hae hands needs to starve." Like all her countrywomen, Jean Cowie had an abhorrence of receiving parochial relief, or "going on the parish," as the Scottish peasantry call it—even out-door relief is distasteful to them. And as to going into the poor-house, it is looked upon by some of the poorest of the poor as worse than death.

Perhaps my readers would like to hear Jean's story as told by herself to a young lady who was buying fish from her. It was as follows:—"Wha did ye say, mem, saxpence—saxpence! Saxpence for they eight bonnie haddies just new oot o' the water, as clean and caller as yersel', mem! Na, na; gang till yer flesher, and see what he'll gie for saxpence. They haddies, mem, cost me a clear white shillin' oot o' ma ain hand this mornin', mem, without the word o' a lee; ay, mem, it's true; but div ye ken what jist sic another creelfu' o' fish as this cost me aince no lang ago? I'll tell ye if ye dinna ken. It cost me a faither, a guidman, an' a son,—yes, a' the three at aince were brocht in till me, stark starin' drooned corpses, wi' the saut sea taim rinnin' frae their hair, and dreepin' frae their claes. Fish, ye see, mem, are no fish, they're lives o' men; an' yet ye wad offer me a saxpence for a' they bonnie haddies! ye valey men's lives but cheaply, you leddies. Ay, a blithe hale

auld chap was my faither. My mither de'ed o' the cholera. An' wha in a' the Braes had a licht'er step or a merrier heart than my guidman? He was nane o' yer skulking men that dread the blast on the tumlin' waves, and wad let their wives an' their weans gang naked an' hungry. Ay, he's faced the angriest sea that ever was seen, an' he could tak a dram or sing a sang wi' the best; an' as for dancin', he was the best dancer in the Braes; he was that. An', oh, tae think, mem, o' ma drooned laddie, ma bonnie laddie wi' his hair like lint an' his cheek like rosy aipples, as braw an' soople a son as ever helpit tae trim a sail or cast a net; he was ma auldest born, an' the ane I loo'ed aboon them a'. Oh! weary day that brocht me sae mickle grief; the Lord only can tell hoo I lived through it a'—a faither, a guidman, an' a son, a' drooned at aince, an' a' jist for sic a creelfu' as Sandy Flucker's boat fush in this mornin'. It's fine wather, say ye; ay, 'tweel is't, an' the sun nae doot gladdens your heart though it vexes mine. It shines bricht an' sunny i' the noo, but wha kens what it may be afore nicht? for it was jist a day like this that the three gae'd awa as happy an' as licht o' heart as the wee waves seem'd that lapp'd and kissed the sides o' oor boat as she rocked at the shore, while I stood wi' Jamie in my airms an' Jenny at my feet, watchin' them set out, and wishin' them gude speed. Ah, dinna tell me, for I ken hoo clear the sky was, wi no a cloud to be seen on't ava, an' the sea wi' just a bit ripple on its breist that caa'd the boat frae side to side; but then a darkness cam an' covered a' the bonny blue lift, an' the thunder, burstin' ower oor hoose, as I sat mendin' my guidman's claes, sent the needle richt intae my hand an' wakened up Jamie in his creddle wi' a skreich; an' as the lichtnin' flashed in at the window I thoct on my faither, an' on ma laddie, an' on ma guidman, an' I prayed God help them an' bring them safe hame; safe hame, ah! they never were to be that, for the boat was already strugglin' 'gainst the awfu' waves that dash in at our coast-side, an' tryin' tae mak for the landin' place; then wives, an' men, an' bairns ran fast, an' gathered on the shore wi' mony a prayer an' cry for help. Wi' Jamie in my airms I ran as weel, an' kneelin' on the rough stanes, the wind lashin' the water aboot me, an' wi' ma bairn held ticht tae ma breast, I cried on Heaven tae save them; but, O! my leddy, I saw them whirled roon by the waves, an' drooned afore ma vera een. Then what a fecht has been mine sin' syne! sic loads tae carry, an' sic weary roads tae tramp! but there's Ane aboon that

keeps us a' richt, an' I'm thankfu' for a' the mercies I hae gotten. Thank ye, mem; but eh, they're cheap at tenpence. Gude day, mem."

As I have indicated, Jean prospered in her own way. In the early days of her widowhood, she was up with the lark, she washed for some of her neighbours, she gathered bait, she knitted nets, and nets in those days were made at home of home-spun twine. She also made and mended for the bairns. Meantime her son became an apt scholar, being quick at arithmetic and apt at such learning as was taught by Dominie Brewster in the school of Shellbraes. When the boy reached the age of eleven, he went out in his uncle's boat to the herring, and the season being a productive one, he earned no less than six pounds as his share of the venture. At that time most of the herring boats of Shellbraes were managed on the sharing system, or by "the deal," as it was called. When but a lad, John Cowie went two voyages to the whale fishery, and again earned quite a large sum of money, as his mother said everything he put his hand to was blessed. By and by he became the half proprietor of a herring boat, along with one of his cousins, and so, little by little, his prosperity increased till he became the owner of no less than three fishing-boats, after which he started business as a curer, and found his industry rewarded with still greater success.

Resuming our tour, I may hint to the reader that it is well worth while, by way of variety, to see the fishing population of the various towns on the Moray Firth. Taking the south side as the best point of advantage, it may be safely said that from Gamrie to Portgordon there may be found many studies of character, and bits of land, or rather sea scape, that cannot be found anywhere else. Portsoy, Cullen, Portessie, Buckie, Portgordon, are every one of them places where all the specialties of fisher life may be studied. Buckie, from its size, may be named as a kind of metropolis among these ports; and it differs from some of them inasmuch as it contains, in addition to its fisher-folk, a mercantile population as well. The town is divided and subdivided by means of its natural situation. There is Buckie-east-the-burn, New Buckie, Nether Buckie, Buckie-below-the-brae, Buckie-aboon-the-brae, and, of course, Buckie-west-the-burn. A curious system of "nicknames" prevails among the fisher-people, and most notably among those on the Moray Firth, and in some of the Scottish weaving villages as well. In all communications with the people their "to"

(i.e. additional), or, as the local pronunciation has it, "tee" names, must be used. At a public dinner held at Buckie several of the fishermen were present; and it was noticeable that the gentlemen of the press were careful, in their reports of the proceedings, to couple with the real names of the men the appellations by which they were best known—as, "Mr. Peter Cowie, 'langlegs,' proposed the health, etc." So, upon all occasions of registering births, marriages, or deaths, the "tee" name must be recorded. If a fisherman be summoned to answer in a court of justice, he is called not only by his proper name, but by his nickname as well. In many of the fishing villages, where the population is only a few hundreds, there will not, perhaps, be half-a-dozen surnames, and the whole of the inhabitants, therefore, will be related "throughither," as such intermixture is called in Scotland. The variety of nicknames, therefore, is wonderful, but necessary in order to the identification of the different members of the few families who inhabit the fishing villages. The different divisions of Buckie, for instance, are inhabited by different clans; on the west side of the river or burn there are none but Reids and Stewarts, while on the east side we have only Cowies and Murrays. Cowie is a very common name on the shores of the Moray Firth; at Whitehills, and other villages, there are many bearing that surname, and to distinguish one from the other, such nicknames as Shavie, Pinchie, Howdie, Doddies, etc., are employed. In some families the nickname has come to be as hereditary as the surname; and when Shavie senior crosses "that bourne," etc., Shavie junior will still perpetuate the family "tee" name. All kinds of circumstance are indicated by these names—personal blemishes, peculiarities of manner, etc. There is, in consequence, Gley'd Sandy Cowie, Gley'd Sandy Cowie dumpie, and Big Gley'd Sandy Cowie; there is Souples, Goup-the-Lift, Lang-nose, Brandy, Stottie, Hawkie, etc. Every name in church or state is represented—kings, barons, bishops, doctors, parsons, and deacons; and others, in countless variety, that have neither rhyme nor reason to account for them.

As an instance of the many awkward *contretemps* which occur through the multiplicity of similar names in the northern fishing villages, the following may be recorded:—In a certain town lived two married men, each of them yclept Adam Flucker, and their individuality was preserved by those who knew them entitling them as Fleukie (Flounder) Flucker, and Haddie (Haddock)

Flucker. Fleukie was blessed with a large family, with probable increase of the same, and cursed with a wife who ruled him like a despot. Haddie had possessed for many years a treasure of a wife, but prospect of a family there was none. Now these things were unknown to the carrier, who had newly entered on his office. From the store of an inland town he had received two packages, one for Haddie (a fashionable petticoat of the gaudiest red), and the other for Fleukie (a stout wooden cradle) to supply the place of a similar article worn out by long service. The carrier, in simplicity of ignorance, reversed the destination of the packages, which, of course, were returned to the inland merchant, with threats of vengeance and vows never to patronise his store again.

Let the reader take, as an example of the quaint ways and absurd superstitions of the Moray Firth fisher-folk, the following little episode, which took place in the Small-Debt Court at Buckie, at the instance of a man who had been hired to assist at the herring-fishery, and who was pursuing his employer for his wages :—

On the case being called, the pursuer stated that he had been dismissed by the defender from his employment without just cause, indeed without any cause at all ; and the defender, on being asked what he had to say, at once admitted the dismissal, and to the great astonishment of the Sheriff, confessed that he had nothing to assign as a reason for it, except the fact that the pursuer's name was " Ross."

" Ye see, my Lord, I did engage him, though I was weel tauld by my neibors that I sudna dee't, and that I cudna expect te hae ony luck wi' him, as it was weel kent that ' Ross ' was an unlucky name. I thoct this was nonsense, but I ken better noo. He gaed te sea wi' us for a week, and I canna say but that he did's wark weel enuch ; but we never gat a scale. Sae the next week I began to think there beet te be something in fat my neibors said ; sae upo' the Monday I wadna tak' him oot, and left him ashore, and that very night we had a gran' shot ; and ye ken yersel', my Lord, that it wad hae been ower superstishus to keep him after that, and sae I wad hae naething mair te dae wi' him, and pat him aboot's business."

The Sheriff was much amused with this novel application of the word "superstitious ;" but in spite of that application he had no difficulty in at once deciding against the defender, with expenses, taking occasion while doing so to read him a severe

lecture upon his ignorance and folly, and to declaim, with some vigour, against the many absurd superstitions of the fisher-folk. The lecture, however, has not been of much use, for I have ascertained that the "freit" in question is still as rife as ever, and that there is scarcely an individual among the communities of white-fishers on the Banffshire coast, who, if he can avoid it, will have any transaction with any one bearing the obnoxious name of "Ross."

I should now like to give my readers a specimen of the patois or dialect spoken by the Moray Firth fisher-folk, although it is somewhat difficult to do it effectively on paper, as the mode of spelling does not always represent the sound; but I will try, taking a little dialogue between the fishermen and the curer about a herring-fishery engagement, as the best mode of giving an idea of the language and pronunciation of the Buckie bodies:—

SCENE—*A Curer's office.* PRESENT—*The CURER and the three "SHAVIES."*

Curer—Well, Shavie, ye've had a pretty good fishing this year.

Shavie senior—Ou ay, it's been geyan gweed.

Shavie tertius—Fat did ye say, man? gweed—it's nae been better than last.

Curer—Well, laddie, what was wrong with last year's fishing?

Bowed Shavie—Weel awat, man, it was naething till brag o', an' fat's mair, I lost my beets, at it; ye'll be gaun till gie's a new pair neist fishin'?

Shavie senior—Ay, that was whan he *k*-nockit his *k*-nee again the boat-shore and brak his cweet.

Curer—Well, but, lads, what about next fishing?

Shavie senior—Ou, is't neist fishin' ye're wantin' till speak o',?

Curer—Yes; will you engage?

Shavie senior—Fat are ye gaun till offer?

Curer—Same as last.

Bowed Shavie—Fat d'ye say, man?

Curer—Fourteen shillings a cran and fifteen pound bounty.

Shavie senior—Na na, Maister Cowie; that winna dee ava, man.

Bowed Shavie—We can get mair nor that at Fitchills.

Shavie junior—I'll be fuppit, lathie, if I dinna hae mair siller an' mair boonty tee,

Curer—Well, make me an offer.

Shavie senior—Ou ay, man ; we'll tak' sixteen, shillin' the cran an' a boonty o' twuntty pound, an' a pickle cutch, an a drappie whisky ; an' that's ower little siller.

Curer—Well, I suppose I must give it.

Bowed Shavie—Gie's oor five shillin' then, an we're fixed wi' you, an' clear o' a' ither body.

And so, on the payment of these five shillings by way of arles, the bargain is settled, and the men engaged for the next herring-season.

The British fisher-people as a class are very sober and industrious, and they are becoming more intelligent, and, it is to be presumed, less superstitious. The children in the fishing villages are being educated ; and in time, when they grow to man's and woman's estate, they will no doubt influence the fisheries for the better. Many of the seniors are now teetotal, and while at the herring-fishery prefer tea to whisky. The homes of some of the fisher-folks, on the Berwickshire and Northumberland coasts, are clean and tidy, and the proprietors seem to be in possession of a great abundance of good cheer.

It is, no doubt, considered by some to be an easy way to wealth to prosecute the herring or white-fisheries, and secure a harvest grown on a farm where there is no rent payable, the seed of which is sown in bountiful plenty by nature, which requires no manure to force it to maturity, and no wages for its cultivation. But it is not all gold that glitters. There are risks of life and property connected with the fishery which are unknown to the industries that are followed on the land. There are times, as I have just been endeavouring to show, when there is weeping and wailing along the shore. The days are not always suffused in sunshine, nor is the sea always calm. The boats go out in the peaceful afternoon, and the sun, gilding their brown sails, may sink in golden beauty in its western home of rosy-hued clouds ; but anon the wind will freshen, and the storm rise apace. The black speck on the distant horizon, unheeded at first, soon grows into a series of fast-flying clouds ; and the wind, which a little ago was but a mere capful, soon begins to rage and roar, the waves are tossed into a wilder and wilder velocity, and in a few hours a great storm is agitating the bosom of the wondrous deep. The fishermen become alarmed ; hasty preparations are made to return, nets are hauled on board, sails are set and dashed about

by the pitiless winds, forcing the boats to seek the nearest haven. Soon the hurricane bursts in relentless fury ; the fleet of fishing-boats toss wildly on the maddening waves ; gloomy clouds spread like a pall over the scene ; while on the coast the waters break with ravening fury, and many a strong-built boat is dashed to atoms on the iron rocks in the sight of those who are powerless to aid, and many a gallant soul spent in death, within a span of the firm set earth. Morning, so eagerly prayed for by the disconsolate ones, who have all the long and miserable night been watching from the land, at length slowly dawns, and reveals a shore covered with fragments of wood and clothes, which too surely indicate the disasters of the night. The *débris* of boats and nets lie scattered on the rocks and boulders, dumb tale-bearers that bring sorrow and chill penury to many a household. Anxious children and gaunt women—

“Wives and mithers maist despairin’”—

with questioning eyes, rush wildly about the shore, piercing with their frightened looks the hidden secrets of the subsiding waters ; and here and there a manly form, grim and stark and cold, cold in the icy embrace of death, his pale brow bound with wreaths of matted seaweed, gives silent token of the majesty of the storm.

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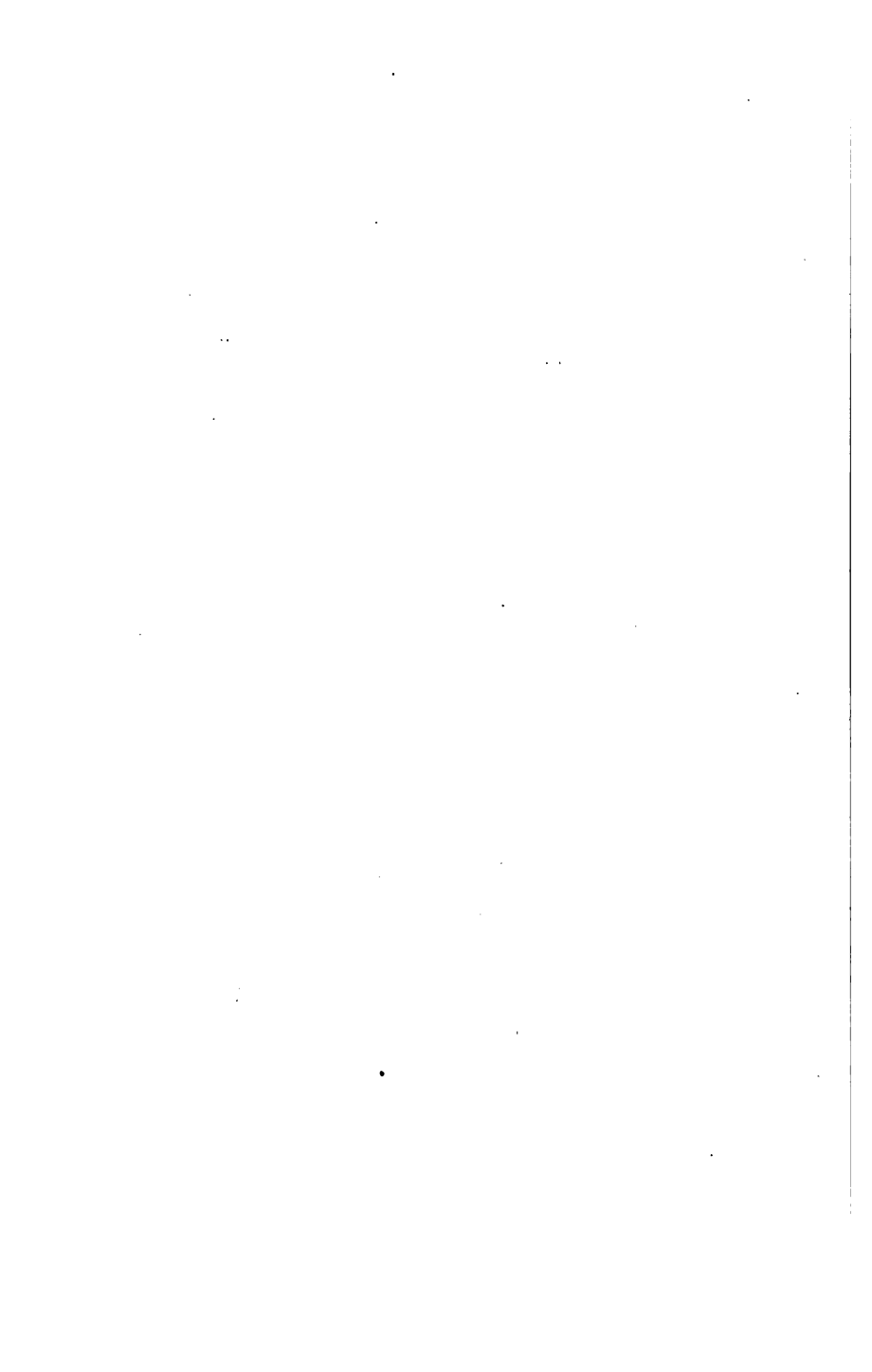
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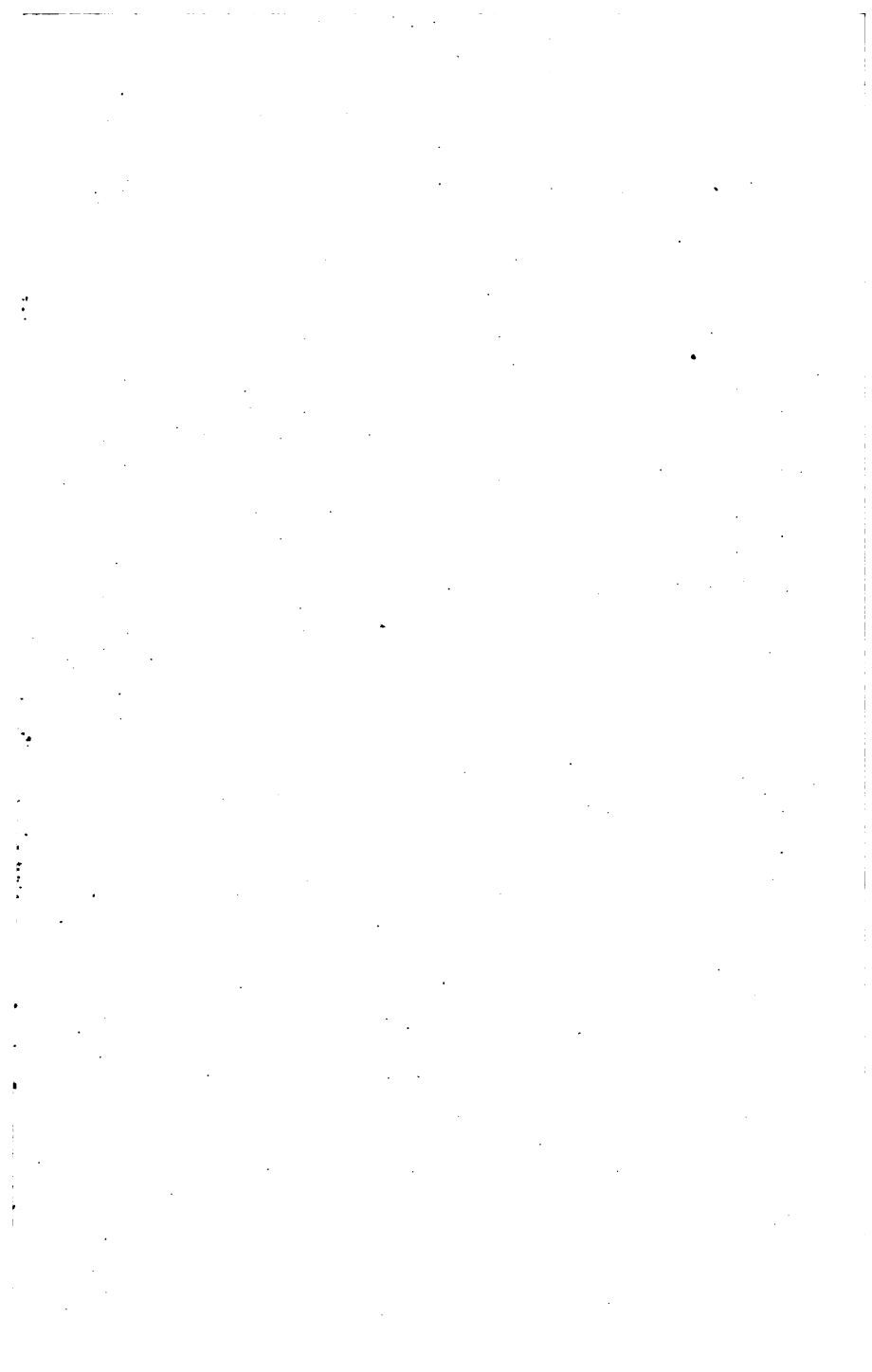
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